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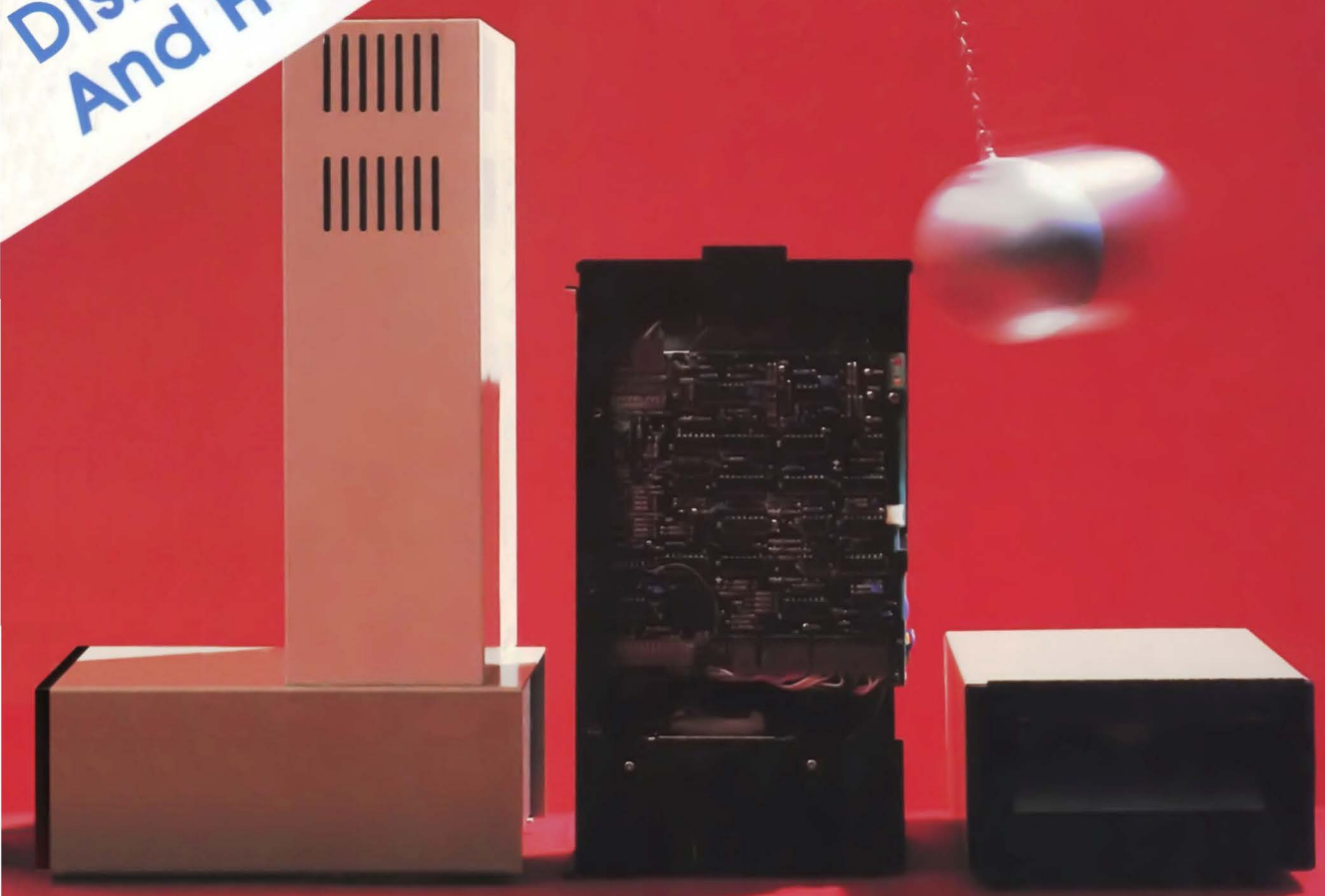
Number 72

Disk Drive Demolition– And How to Avoid It!



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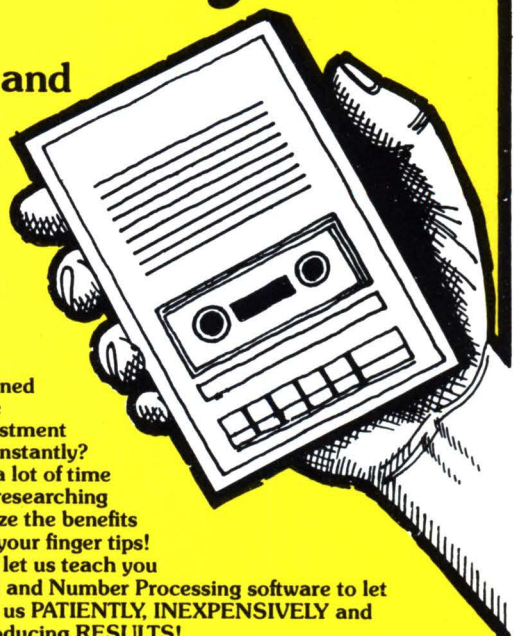

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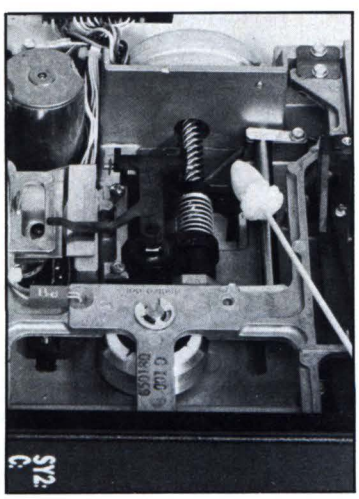

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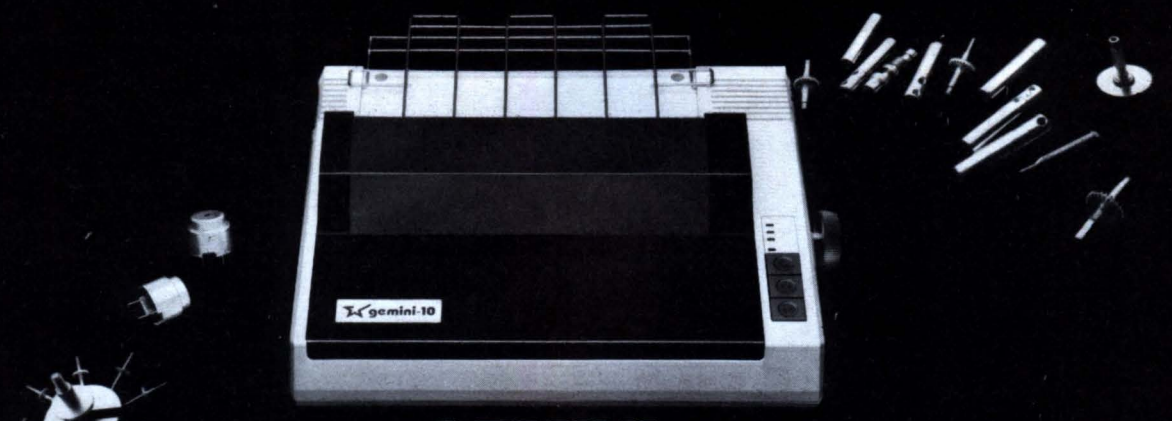

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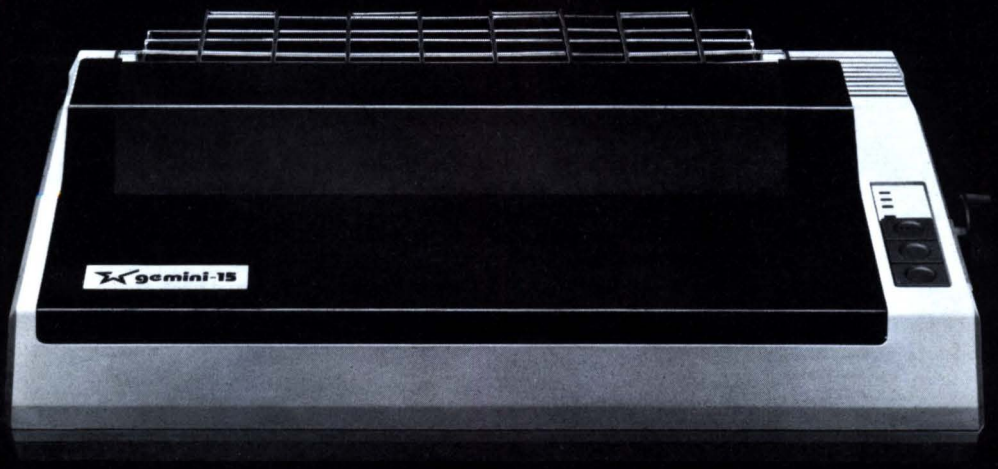

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By Wayne Green

When Will Apple Make Its Move?

Bad Times for Apple?

The rapid developments of the lower-end computers vs the computerized game computers could have some serious repercussions with the established leaders in microcomputer sales such as Apple and Radio Shack. The Shack saw this coming and tried to counter the trend with their low-end Color Computer (CoCo), but their lack of aggressiveness with it has cancelled a good deal of the impact.

Think about it.

At first the market started out with the sudden growth of the computerized games by Atari, Mattel, and so on. That turned into a very big business. This Christmas it looks as if the steadily lowering price of the low-end computers such as the Atari 400, the VIC-20, the TI-99/4A, possibly the CoCo and an entry from Panasonic (JR-200) will play hell with the dedicated game computers. Oh, let's not forget the Timex Sinclair-1000 either. No, at under $100, we really can't forget that one.

The industry thinking is that these computers which can also play games will clobber the dedicated games which can't compute. There will be no contest. The prices aren't all that different. The limiting factor will occur in production, not sales.

OK, now that you are thinking about that and nodding your head over it, let's take the situation a step further. Remember, if you will, that one of the big reasons that the Apple is so popular is that it was one of the lower-priced microcomputers, but with color. The TRS-80 was low priced and available from 10,000 Radio Shack stores. Now we see color computers at far lower prices which are being sold through almost any store with a door on it. Don't you think this is going to raise hell with TRS-80 Model III sales and Apple II sales? I'll be astounded if it doesn't.

Sure, you and I know that the increased computing power of the Model III and the Apple II are well worth the higher cost. But we also have to grudgingly admit that the new hobbyists and the kids who are going to flock to the low-end computers will get enough computing power to keep them busy. Also, as a result of economies of scale, they will get more computer per dollar than we are getting with our more expensive systems.

Radio Shack can cope with this situation by cutting their margins of profit on the CoCo, opening up sales to non-Radio Shack stores to build up their volume of sales and thus reduce costs of manufacturing, getting more of it made in Korea or the Philippines to further cut costs, making deals with some software houses to get the desperately needed programs for the system and arranging with outside suppliers to out-accessory the competition. Yes, they *can* do it, but this would take a total about-face in long-standing company policies, something we have yet to see happen. The worst of it is if they don't make these moves and make them quickly, the window when they could have made the change will have passed.

Apple, unless they are being even more secretive than ever before, is indecisive about getting into the low-end battle. This could be disastrous for them. Yes, even for a firm of their size, the low-end battle is an expensive and dangerous one. But is it more dangerous than losing not only all of the low-end, but possibly watching the low-end eat rapidly up into the higher end, pushing Apple into a choice of either becoming a business system or disappearing? Right now, while the Apple is appealing (pardon) for many business applications, most of the users are at least partly hobbyists.

It will be a simple matter for the low-end computers, taking advantage of their low costs, to add accessories for their systems which will bring them gradually up into the middle price range. Remember that the computers themselves have plenty of power; it's just that some have crummy keyboards, lack monitors, need disks, and so on. Most of the differences between them and the middle range systems can be bridged.

But then let's look at this from another viewpoint. I was talking with one of my advertising people for *73* magazine and he was kind of putting down the Timex computer. Déjà vu.

How long ago did we watch the maxi-computer people sneer at the minicomputers? And wasn't it just three or four years ago that the minicomputer folk were having a hearty time over our "toy" microcomputers—the computers which are pushing them right out of business today, just as they did the maxicomputers a couple of years before?

But what, you chuckle, can anyone really do with a Timex computer? Plenty, oh prematurely laughing one.

For example, the ad department for my magazines includes about 25 people, each with a desk and a telephone. Suppose we were to put a Timex computer and a small monitor on each of the ad sales people's desks. This could be connected to a host computer—possibly an Apple—which would then allow any of the computer/terminals to communicate with any desired terminal or allow the people to access a database of addresses, sales information and so on.

Sure, we could do the same thing with Apples on every desk too, but at *ten times* or more the cost, minimum. There's a big difference between spending around $175 per station and $1500 or so. And the Timex takes a lot less room. Sure, they won't be using the Timex for word processing or number crunching, but as a dedicated visual intercom and database terminal, what would be better?

And that's just the tip of the iceberg. Once you get to thinking about the applications of small computers, you can see where the low-end systems are going to be incredibly popular and useful, and very well could raise hell with the sales of the $600 and up to $2000 computers.

With no entry on the low end, will Apple be pushed further and further into the

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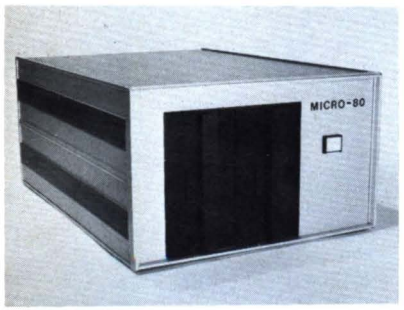

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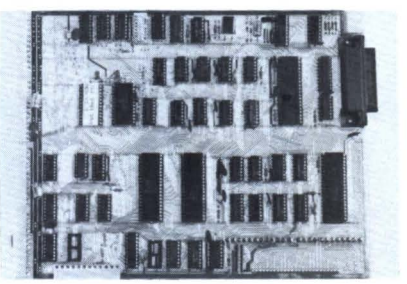

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higher-price ranges? The rumors are for a 16-bit Apple to be anounced. Once they move to higher-priced ground, can they ever get back to the lower-price systems . . . and the bulk of the market? The higher they move in price, the fewer systems they are likely to sell.

Remember, too, that many of the newcomers to computing are going to be interested in getting their feet wet with the lowest-cost system they can get which will be capable of being expanded into a higher system. Why gamble $2000 on a start when they can get going for $89 and work upward? We already know that most of the people who have computers today started out low and gradually increased their systems. Why should we expect this to change? The newcomers certainly are not going to know much more about computers than we did when we got started.

Send a Match

Sherry and I have been going on the Asian electronics show tour for the last three years, off and on, and having a wonderful time. It has been invaluable for me to keep in touch with what is going on in that very critical part of the world.

The tour, which runs each October, is timed to coincide with consumer electronics shows in Japan (where it alternates between Osaka and Tokyo), Seoul, Taipei and Hong Kong. It is a fast tour, fitting the four shows all into 13 days. This means that for each show you spend a day in travel and two days in the city.

There is a lot to do in each of the two days. You'll want to see the cities, have plenty of good meals, see the new electronic products at the shows, talk with manufacturers and exporters, and so on. In general we tend to see mostly the products from a few of the giant firms over here and not realize that there are hundreds upon hundreds of smaller firms with very competitive products which have no easy way of getting to us.

Unless your soul is indeed jaded, you will have a difficult time looking at all of those interesting products and not wondering if you might start importing some of them. Or you might find a small firm which would like to tool up and make one of your products or a part of one. One thing is for sure, if you are in the electronics or computer business in any way, this will turn out to be a profitable business trip.

At the end of the show tour you have the option of extending the trip to locations of your choice. This year's tour offered options of a visit to China or a trip to the Munich electronics show!

In 1980, the last time Sherry and I went, we opted to go from Hong Kong to China for a few days and then to Macao, thus allowing me to pick up two new countries to add to my list of countries visited. I try to always add one or two new ones on each trip we make, if at all possible, with the aim of eventually visiting 200 countries. I'm getting there.

In 1979 I added Hong Kong and North Korea, stopping off on the way back at Guam, which I hadn't visited since the war, when my submarine stopped off there for a rest and refitting.

This year we will be going a different route after the Hong Kong show, heading down to Singapore, which I last visited in 1966, and then to three new ones, which are really in the sticks. There is Kuching, Bandar Seri Begawan and Kotakinabalu. Those are the capitals of Sarawak, Brunei and Sabah, which is probably news to non-ham readers.

I looked through the subscription records of my magazines and found that, believe it or not, we have subscribers in these countries. Now aren't they going to be surprised when I stop in to visit? I'll try to find out what is doing computerwise in these Malaysian countries and let you know. But if you'd had any gumption, you would have signed up and been with me, you know.

The whole trip is ridiculously inexpensive. I may be a multi-zillionaire, but I'm about as thrifty as Yankees come, so I make every dollar work as hard as it can for me and you can bet that when I recommend a tour that it is not only first class, but is one hell of a bargain.

When a letter from a ham in Singapore included a brochure about a ham convention in Bangkok, I quickly shuffled the flights to get us there for a couple of days. I've visited Bangkok on two past around-the-world trips—in 1959 and 1966, so I'll be interested to see the changes.

But now to the matches, and something you can do for me. Some people collect ashtrays, some postcards, some hotel towels (some collect hotel televisions, too, but that's something else). I try to pick up a pack of matches from each hotel or restaurant I visit. This doesn't take much room in my suitcase and gives me a way of remembering places I've visited. My collection suffered a setback when one of my ex-wives took a huge box of my matches to use for smoking. Imagine using matches from Nepal just to light cigarettes!

Well, I didn't think much about this collecting habit of mine. It wasn't as if I was really into matchbook collecting, which I know some people used to take seriously. I never really knew what to do with 'em until one day Sherry and I were in Boise (Idaho), stopping off to visit her daughter and grandchildren. The local McDonalds had tables covered with matchbook covers, protected by a top of clear plastic. It made an interesting and unusual table top. Hmmm.

I've been thinking about that. Now suppose that readers of my magazines who are in or visiting unusual parts of the

world were to pick up a package of matches and send them to me? That would make quite a display. The fact is that just with 73, my ham magazine, we have subscribers in over 200 countries! So, tell you what, the next time you come across a particularly good restaurant—anywhere—pick up some matches for me and send 'em along. I'd like to hear from you anyway and most of you haven't written. When I get enough interesting matches I'll start making some wall displays.

In all probability Sherry and I will be going to the Asian electronic shows again in 1983, so why not start making some room in your calendar for late October and November and come on along with us. There are usually about 200 or so on the tour, so even if I turn out to be a crashing bore you'll have plenty of fascinating company.

Then, after the four electronics shows, you can bet that we'll be off to some very unusual countries. I don't know where yet, but it might be Bali, Portugese Timor, West Irian and places like that. The show tour runs about $2500 this year, and that includes first-class hotels, all transportation, most breakfasts, a lot of dinners, and so on. It's a super tour. One single business connection would pay for that many times over.

Remember, if you do go somewhere unusual, send me some matches.

Rip-Off Warning

I have recently received several direct-mail pitches for a very nice-looking attaché case. It's a bit expensive, but it looks so nice in the ads that it grabs you. It looks particularly handy, with compartments which open on either side—even one for credit cards and business cards which can be snapped open with a small button.

At $200 in some mail-order catalogs, this should not only be a nice-looking attaché which one can use with pride, it should also be well made. It isn't. I got one of them and by the second day of use it was falling apart. The snaps were put in with small tacks, the compartments with staples, and everything started falling apart almost immediately. What a disappointment!

There isn't even any way to fix it up. The nice-looking cloth inside is glued over the staples, so you would have to rip everything apart to replace the little tacks with sturdier fasteners so the clasps and snaps would stay on. Phooey.

This disaster goes under the name Double Agent and may appear in some of the airline shopping catalogs and other mail-order catalogs. Beware. This $200 case, even if bought at the sample price of $100, is no bargain.□

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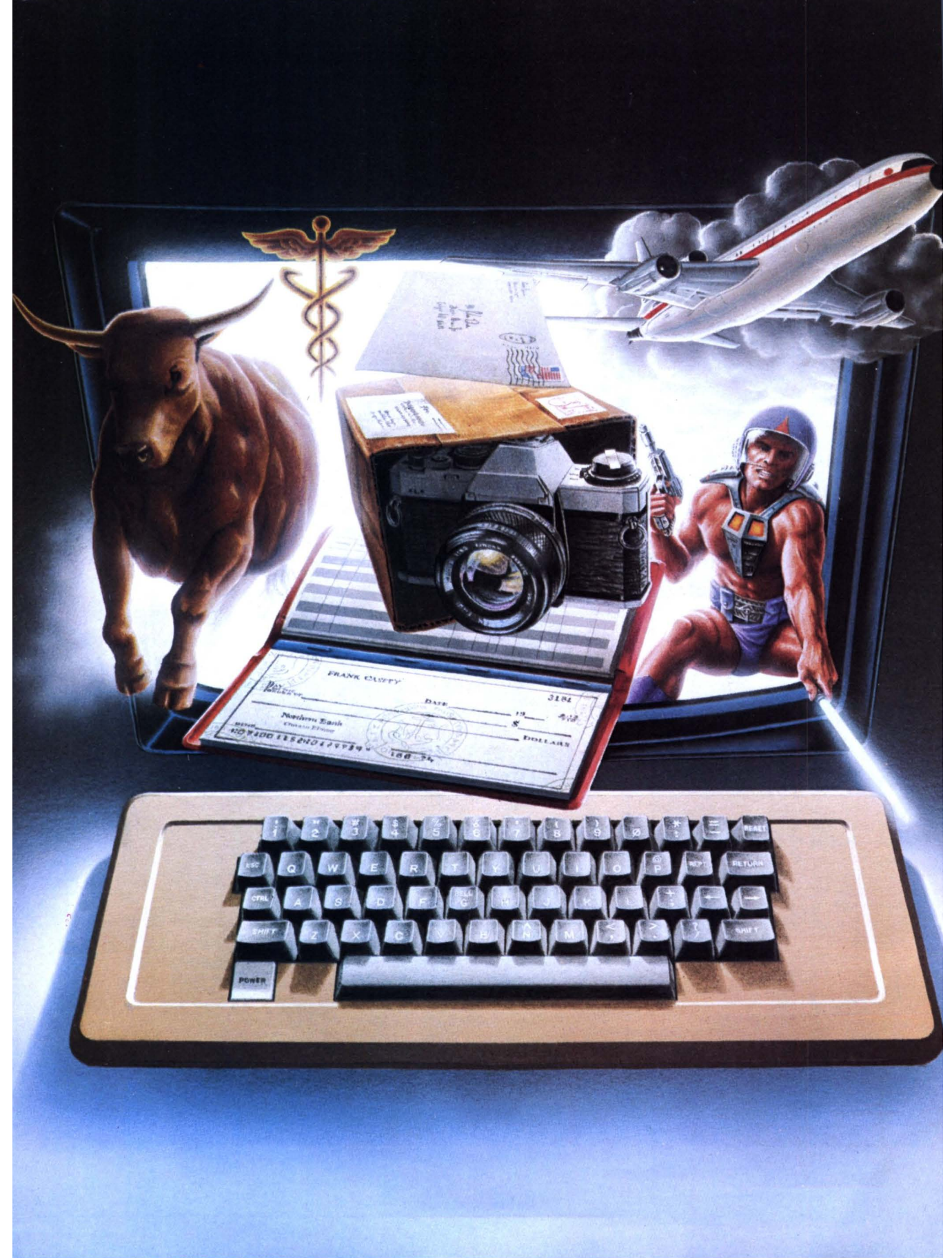
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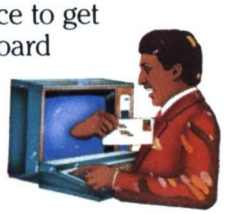

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By Frank Derfler

How Portable Is Your Software?

A Call for Future Software to Be More Flexible

This month, we'll tackle a subject of importance to a growing number of managers in business, education and government: software portability. On the way, we'll learn a few things about microcomputer systems and data communications. But first, an appeal for help, a reminder about my chronograph contest and a look at some IBM PC hardware.

Sinclair/Timex

Many of us are probably too sophisticated to consider buying a microcomputer that sells for less than $100. That's a shame.

The family of small systems called the Sinclair ZX-81 and Timex Sinclair 1000 can do some interesting things. I know these little machines can communicate, but I don't have many details.

If you make communications hardware or software for the ZX-81, please let me know. I would like to help the new and probably inexperienced owners of these machines discover how useful communications can be.

Chronography

Those of you who own Hayes Chronographs: remember, I'm running a contest to find the best use of a chronograph. I want to hear about your practical applications and how you interface with the chronograph. I'd like to see a description of your application and of the software needed to make it work. The winner (selected by me) will receive an autographed copy of either one of my books, *Microcomputer Data Communications Systems* or *TRS-80 Data Communications Systems*, and nearly eternal fame. If you have a new application for a Hayes Chronograph, drop me a line.

Quadboard

The availability of only five expansion slots in the IBM PC is a recognized limitation of the system. The five slots quickly fill up with needed circuit cards such as the disk controller, video interface and communications ports.

PC owners need to get all the mileage they can out of the slots they have available. The Quadboard from Quadram Corp. helps to make the most of your PC—and it tells time too.

The Quadboard combines a clock with an RS-232-C serial port, a parallel printer port and RAM memory expansion. With a Quadboard, you can have the functions you're most likely to want in one expansion slot. You'll also have room for more unique features in the two remaining slots.

The parallel and serial ports provide for several flexible operating combinations. Both ports use the same connectors used by IBM, so no special cables are necessary. The printer port on the Quadboard can be placed at the standard printer address (used by the port on the monochrome video card) or it can be addressed as a second printer port.

The serial port on the Quadboard is a duplicate of the IBM serial card, so all standard software works with it. This RS-232-C port also can be switched to a second serial interface address, so it can be combined with another serial card to give the PC a dual serial port capability. This is handy for communicating simultaneously with a printer and a modem or for using a device that needs its own RS-232-C port (like the Hayes Chronograph).

Quadram intends to release a Quadboard with two serial ports instead of a parallel and serial port. This would allow many PC owners to use the printer port on their monochrome video card and to have two handy parallel ports.

Quadram already has a separate communications card, called the B320, which provides only two RS-232-C ports. If you have all the memory you want and don't need a clock, this board can be a useful addition to your machine.

One of the Quadboard's features is the QuadRAM-Drive software. This software allows the RAM on the Quadboard to act as a solid-state disk drive. Files and programs are stored in the assigned block of RAM just as they would be on a mechanical disk, which provides for fast, quiet and efficient operation.

The only times you need a mechanical disk are when you start the system and when you save a file before you shut down the system. The solid-state disk can improve processing time tremendously.

The Quadboard is an economical way to give your machine some practical capabilities while retaining opportunities for expansion. It retails for $595 with 64K of RAM, both ports, the clock/calendar and the QuadRAM-Drive software. A 256K version lists for $995. All of the sockets are provided on the board with less memory, so you can buy the 64K board and add RAM as your need grows.

For more information on the Quadboard, contact Quadram Corp., 4357 Park Drive, Norcross, GA 30093, or call 404-923-6666.

Software Portability

Portable software isn't something you can copy from a friend; it's the ability to move programs and data files between different microcomputers.

Microcomputers are entering offices and factories in increasing numbers. Sometimes they come in legally as part of a program to improve productivity and sometimes they come in disguised as automatic typing devices or as "spare parts" purchased in packages inexpensive enough to be within the spending authority of some junior manager.

Often, they are carried in by individuals who enjoy the help of a computer at home and can't see why they should be without one at work.

As more and more data is captured on the disks of these machines, the manager is faced with the need to move the information from one place to another, protect it, verify it and use it. In addition, he'll want to move and share local programs

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and useful software.

The use of common programs and templates can help to standardize the products being turned out on office microcomputers. This ability to move files and programs easily from system to system is software portability.

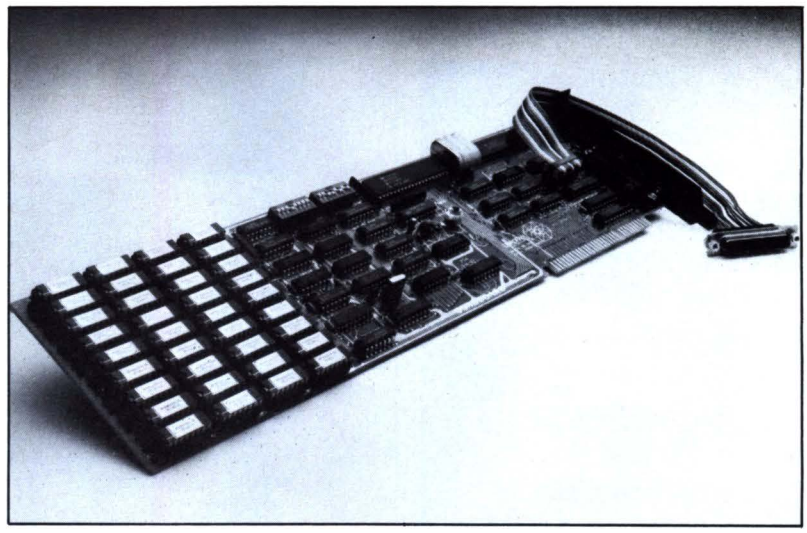
There are several major and minor factors working to determine how portable your software is. The major factors are:

- The operating system
- Disk format
- Communications capability

The minor factors include:

- The type of CPU
- The system architecture
- Peripherals needed
- Higher order languages

Interestingly, the list of minor factors includes some usually considered to be important in the selection of a system. But you have to have a couple of the major factors before the minor ones become important to software portability.



Quadram's Quadboard (for the IBM PC) is a single board combining RAM, a serial port, a parallel printer port and a clock. The Quad-Drive software package allows flexible selection of the amount of memory to be devoted to RAM disk operation.

Operating Systems

The type and version of the operating system used by a microcomputer can be critical to software portability. The same operating system running on different machines can provide excellent portability. Identical machines with different operating systems can be total strangers to each other.

TRS-80 owners discovered this as they suffered through the changes in the TRSDOS operating system. Apple II users can tell a similar tale about the versions of Apple DOS.

The use of identical hardware does not guarantee file and program portability. The use of identical operating systems, even on different hardware, can give this portability.

Three or four microcomputer operating systems have gained universal acceptance; CP/M is probably the most well-known. It provides a standard face regardless of what hardware it's running on. Thousands of applications programs are available for use under CP/M.

MS-DOS (also known as PC DOS and by several other names) has risen quickly to become a de facto standard operating system among 16-bit processors in the 8086/8088 family. And the number of computers able to use MS-DOS is growing.

Some might argue that CP/M 86 will become a universal operating system for 16-bit machines. It may be an alternative, but MS-DOS has a strong start and will be difficult to catch.

UNIX has the potential to become a standard operating system for 16-bit machines, particularly those using the 68000 microprocessor. It's unique because of its upward compatibility with many mini and super-mini computers. UNIX has strong commercial backing and may gain popularity with the 8086/8088 family because of its potential for sharing files and programs with minicomputer systems.

An identical operating system, though, does not ensure the ideal version of software portability. The problem of dealing with the many different disk formats in use has been significant.

Disk Formats

Because of hardware and firmware considerations and the desire of system designers each to solve the same problem a little differently, we are faced with chaos in the area of disk formats. We now have at least four disk sizes (8, 5 1/4, 3 1/2 and 3 inches) and they're divided into other physical categories too numerous to describe here.

The capacity of these drives varies. Identical-looking disks may be formatted to carry between 80 and two million kilobytes of data. Even physically identical disks recorded with the same storage density can be incompatible because of minor differences in the recording scheme.

Moving software around under these conditions calls for detailed pre-planning, strong enforcement of operating standards and extensive coordination of operating system changes.

There are two bright spots in the area of disk formats. The first is the acceptance of the IBM 3741 single-density eight-inch disk format as the standard for CP/M software. The 3741 standard isn't perfect. It has only a moderate storage capacity that doesn't use the potential of the eight-inch disk; still, it's standard and it works.

Versions of the CP/M operating system able to format an eight-inch disk for nearly a megabyte of data can still read the 3741 single-density format. This standardized format has to be credited for the original popularity of CP/M; probably its only drawback in the area of software portability is the physical size and cost of eight-inch drives.

The 5 1/4-inch minifloppies are inexpensive and take up less space, but there are almost as many formats in use for these disks as there are computer manufacturers.

But an evolving trend provides the second bright spot in the otherwise murky picture of disk-drive formats. Several manufacturers are giving their systems the capability to read disks of other common systems.

Adam Osborne plans to equip the Osborne 1 to read any soft-sectored byte-oriented disk with a capacity of under 200K. The Kaypro II from Non-Linear Systems writes disks with a capacity of over 190K, but it can read disks written in the popular Xerox 820 single-density format. The Baby Blue Z80 CPU for the IBM PC can read disks prepared in several different formats.

This trend toward a multiple-read capability is healthy and makes use of the power inherent in a properly and creatively written operating system.

The Communications Port

There will be times when information must be moved between computers with incompatible disk formats and different operating systems. For those cases the RS-232-C ASCII-coded serial port, available for the majority of microcomputer systems, can move information through a standard communications format.

The RS-232-C serial port is a slow path for data, which must be sent and received one bit at a time instead of moving in a parallel stream of eight bits. It also can be cranky. You have to set several parameters correctly to ensure good communications.

The RS-232-C serial port is, however, a widely-used standard and it provides capability for long-distance transfer of infor-

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mation using telephone lines or other means of communications. It doesn't care about operating systems and disk formats; using the right software, a computer can receive and transmit data through the port, save the data it receives on disk files and transmit disk files out the port.

The transfer of data can be done directly between computers or indirectly through an intermediate link, such as an information utility (for example, Source or CompuServe). Direct transfer requires the transmitting and receiving ends to simultaneously coordinate their actions. Indirect transfer provides for a time buffer of minutes, hours or days between the original transmission and the final capture.

If direct transfer is being used, it is beneficial (but not absolutely necessary) to take advantage of various error detection and correction schemes available in communications software.

Some communications software, such as Crosstalk, is available in a number of disk formats for CP/M and IBM PC systems. Other software, such as the series of programs from Southwestern Data Systems, has several protocols built in so it can work with other programs.

Transferring a program from one machine to another will not assure that the program will run. You still need a compatible operating system or programming language to transfer usable programs. But files of words or numbers, particularly if they are written in standard ASCII and not some compressed format, can be transferred between different systems and are usable at both ends.

You may encounter some difficulty when control codes have been used to mark the ends of paragraphs and other features, but it usually can be cleaned up at the receiving end.

The communications capability of a microcomputer can be used to increase its acceptance of portable data and program files. This capability isn't perfect (it's slow, sometimes awkward and may require specialized software), but it provides a standard path in and out of the computer when no other is available.

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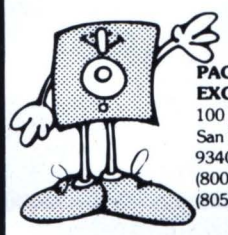

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The Minor Factors

Managers setting out to buy microcomputers typically worry about the CPU the system uses, the bus structure or architecture and the programming languages available for the system. From the standpoint of software portability and practicality of use, these should be secondary to the factors of operating system, disk format and communications capability.

If the operating system is complete, the type of CPU in use will be invisible to the user. Dual CPU machines are becoming common and so are operating systems able to run on more than one type of CPU (e.g., UNIX).

Higher-order languages are fine, but the trend today is to skip over the detailed programming step and use packaged software with built-in flexibility, such as spreadsheets and database management systems.

None of the common word processors, spreadsheets or database systems care what programming language may be available in the computer. They have their own command languages that are faster and easier to learn than any programming languages.

These packaged programs can be used in different ways and, most importantly, move the end user away from the need for traditional programming and data-automation skills.

The Next Generation

Portability of data files will become even more important as the next generations of applications programs appear.

Activity in an office or business does not focus on one job from beginning to end and then move to a new topic; it's a combination of false starts and new directions and a little work done in several different areas at the same time.

The next generations of software will recognize this and attempt to adapt with simultaneous processing and the ability to halt and resume work without a complete restart. In this environment, the ability to share data between systems will become even more important.

Software portability will be a growing concern of anyone really trying to make microcomputers work.

Info Wanted

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WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

A First Look At Super SuperCalc

Sorcim Improves It For the PC

This month we've got a lot of review work to do together, so no time for opinion, diatribe, or even fun (but see the program listing for this month's game program).

I'll be reviewing some books and book/disk combinations this month in the documentation area. Additionally, we'll take a look at SuperCalc², The Programmer and the Condor DBMS in the software area. And, for you hardware lovers, we'll look briefly (an extended-use report will be forthcoming) at the Davong Systems 12 MB(!) hard disk and the Vista 576K RAM Card. Then, some "what's new" announcements, and it'll be time for the holidays.

Documentation

Let's start with the documentation, since it's easiest to evaluate. Sapana Micro Software (PO Box 748, Quincy, IL 62301, 316-231-5023) is offering a *Software/Hardware Directory and Guide* for the IBM PC, which will be updated every six months.

The July 1982 directory, which contains 20 pages of listings suitable for insertion in an IBM Reference Manual, is now available, although the company doesn't tell us its price for this service, or how to get it if we want it. The listings look useful, but I wouldn't pay anything exorbitant for them. Additionally, the July release contains a list of IBM Personal Computer Users/Owners, and it's shorter than a page. Either IBM is lying, or Sapana missed a few somewhere! Seriously, though, this looks like a decent package, depending on the price.

Something that doesn't look so decent is the *IBM/PC Survivor's Manual*, written by John S. Mayer and published by Mayer Associates. This book retails for $11.95, or is available through the mail from the company (755 New York Ave., Huntington, NY 11743) for the same price plus $2 shipping. Frankly, I can't find much in it you wouldn't already know if you've managed to get your system up and running in any way.

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

The material it presents is well-covered in IBM's *Guide to Operations* with the exception of lesson 1, "Inspecting the Hardware," which tells you how to boot the DOS disk and how to tell the printer from a disk drive. On the other hand, there are a whole pile of folks who are "computerphobes" (that is, scared silly by digital monsters) out there, and another whole pile of people who are computerphobes and have to live with someone who fools with a PC continually.

The book generally is clearly written, does not intimidate like that shelf full of IBM manuals does, and gets you to where you can boot your system, format a disk and run the Samples.BAS program on your DOS master. If that's what you need and all you need, I'd recommend the book. However, 35 pages (its length) divided into $12 (34 cents per page) is not cheap.

VisiCalc for the IBM Personal Computer, written by Edouard J. Desautels and published by the Wm. C. Brown Company (PO Box 539, Dubuque, IA 52001), a spiral-bound 155-page book with a 5 ¼-inch disk, is a well-written, clear VC tutorial. It will take you from never having seen the program (where have you been?) to complex portfolio analyses in little time and with little effort.

The book is especially useful since all those tedious examples the other tutorials want us to key in are supplied on the disk (bring your own VC—this is a data disk), and all you need to do is load and follow the exercises in the text.

I found Desautels' section toward the end of the book, "When to Avoid VisiCalc" to be extremely useful. It points out the significant limitations of the program for some applications, and even when paper-and-pencil might be a better attack on a problem. I look forward to finding the time to work my way through the examples. Price is $39.95, with a 30-day examination and return policy.

Software

Speaking of spreadsheets, let's look at "super" SuperCalc (not an evaluation . . . this is version 2 of SuperCalc) for the IBM PC (Sorcim Corporation, PO Box 32505, San Jose, CA 95152). Its cost is $295 for about 100 pages of tutorials and references and a 5¼-inch disk. In a word, outstanding!

First, you need to understand SuperCalc, which is too complex for me to review in depth here, but which you can read about in many other reviews. For one thing, the program almost helpscreens you to death; it's pretty hard to get into trouble the answer key won't get you out of.

Next, you should know that you can see your formulas as easily as your data, just by asking for them to be displayed instead of the data. Third, SuperCalc² makes a complete package, including a good tutorial and reference card.

What's especially impressive is the degree to which Sorcim has gone to adapt its code for the PC, instead of just translating it and hoping everything will be OK. Moderate use is made of the IBM's special function keys. The program supports almost all the memory you'd ever want to stuff inside those five slots.

For you color fans, Sorcim provides two .COM files, Color and Mono, which allow the SuperCalc² user to select the monitor of his/her choice. And yes, if you choose Color, the border is IBM blue, the matrix is yellow, the positive numbers are in white, and negative results are printed in red. Very nice indeed.

The Programmer, from Advanced Operating Systems (450 St. John Road, Suite 792, Michigan City, IN 46360; $199.95, 118-page spiral-bound tutorial and reference manual, plus one 5 ¼-inch disk and labels) is everything The Last One claimed to be but couldn't deliver because of a bad case of SLOW.

This little devil, a Basic program gener-

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ator written in BasicA, is fast. Menu-driven, it helps either the programmer or nonprogrammer develop Basic applications by generating code from a user's menu choices (e.g., clear the screen, draw a line of asterisks, input from the console to variable PNAME with prompt "What Name," etc.).

The tutorial is well-written and develops a working mailing label program. Additional programs to generate colors and sounds, and a phone list program, are included. The reference manual is complete and both tutorial and reference manual thoughtfully put your responses in a different color from the rest of the text—a nice touch.

Now, how does it work? Well, it works fine, but you have to be clear about some things. First, note that I said this program is written in BasicA and generates Basic code. That means you won't be able to use BasicA's features (mostly advanced graphics) in your applications programs.

Next, there are some small discrepancies between the program's operation and what the manual says will happen—common in a complex implementation like this, but still not excusable.

Third, any programming program excels at writing the tedious kind of boilerplate (input/output, disk access, utility functions like screen clearing and formatting) that we all abhor but have to do. By the same token, such programs are very poor at dealing directly with esoterica (The Programmer does let you insert Basic code statements into the program as it's being developed) like knowing which locations to poke in order to clear the mono screen, turn on the color one and correctly relocate the cursor.

True to its subtitle, The Programmer *is* a complete program writer for your microcomputer, much more complete than some others I've seen. It's fast and does a creditable job of generating lots of Basic code from few user keystrokes.

Whether it will replace your need to have a working knowledge of Basic, however, is highly debatable. In fact, I'd rather see at least moderately experienced programmers buy The Programmer, for it is they who will gain most from its ability to shortcut the boilerplate and produce reasonable programs from menu choices. About 30K of BasicA's 64K workspace is left for applications programs after The Programmer is running. I like this one, but you should get a demo before you plunk down your money.

The Condor Series 20 relational Data Base Management System (Condor Computer Corporation, PO Box 8318, Ann Arbor, MI 48107; 100-page manual, another 100-plus pages of reference manual and appendices, three 5¼-inch disks, no price given but *implementations for* other machines retail at $899) is a powerful database manager (DBMS) recoded to run under PC-DOS. (This is not as clear as you'd think; the manual says you need CP/M to run it—you don't.)

The DBMS is a sophisticated manager and report generator that allows very easy file specification and screen design for database entry, and then provides an extended set of commands to manipulate, update, and even automate execution of the DBMS application.

After defining some database and inputting the data (this can also be read from existing data files, WordStar, etc.), the user has at his command some 43 basic options to manipulate that data. Indexing is supported, as are statistics and tabulations on various DBMS fields.

The Series 20, Level II implementation is distinguished from its Level I cousin by the presence of a very sophisticated report generator, among other things. Databases can be reorganized to include additional fields without having to re-enter them as well.

Condor is well-known for producing one of the best DBMS systems around. If your experience is mostly with file managers or Basic- or Pascal-coded DBMSs, you'll have a pleasant surprise with Condor. The manual is in no way easy to work through, but is complete and contains a tutorial on developing an automated general ledger system for a small business.

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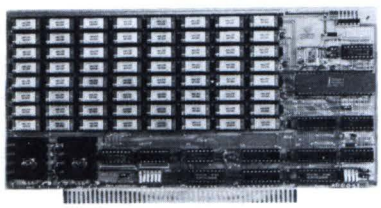

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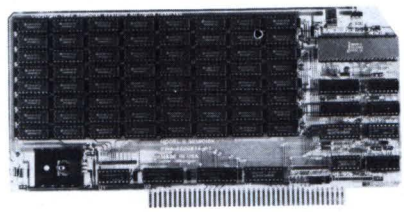

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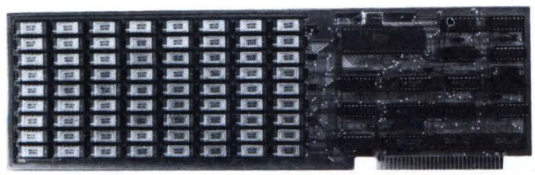

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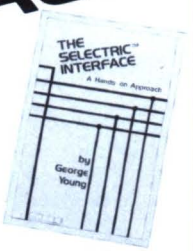

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One nice feature of the system is its ability to create "help" menus, which allow turnkey operation of an application by someone unfamiliar with the DBMS, and perhaps unfamiliar with a computer. The high-level report writer, present in the PC implementation of Level II, is valuable, since its absence was a major disadvantage for Level I users on other machines.

The only criticism I have of this system is that, at this price, I expect and demand a manual tailored to the PC user. Condor's is not. There isn't even an appendix or special section for the IBM user—it is blithely assumed that you are running the system on a CP/M-based system, or else on a NEC computer. The unaware user, because of this, would open the documentation and believe that the system requires CP/M-86 for use.

Hardware

This month we'll look at the 576K Maxi-Card from Vista Computer Company (1317 E. Edinger Ave., Santa Ana, CA 92707; $1395). This hardware can punch your machine up to levels of RAM that equal some of the smaller minicomputers on the market. The Vista board is well-designed, easy to install, and can be a useful addition to your machine depending on how you use it. That's what makes this board either a great buy or a bad buy for you.

Circle 319 on Reader Service card.

For one thing, this offering from Vista carries no serial port, so you're only buying memory. For another, there are certain software packages, including PC's own Basic and BasicA, which cannot take advantage of more than 64K of memory. While we can hope this will be fixed in the future, it is currently impossible to use a Basic workspace of more than 64K. SuperCalc and UCSD Pascal, by contrast, can and do take advantage of increased memory.

Speaking personally, I would have appreciated Vista supplying software to allow the MaxiCard to be used as a phantom disk drive—as a large in-computer memory space for storing files. (Seattle Computer Company has just released such software for their board, and we'll look at it in a later column.) I *like* the card, though, and you should know that (with the exception of semi-disk software) the faults I point to here are not of Vista's doing. Consider carefully what you need from an add-on card before you buy.

The Davong Systems hard disk is also a fine piece of hardware (Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043; $2695 at Computerland dealers). But you must carefully examine your needs and applications before buying one. First, imagine having 12 megabytes of storage available to you. That's the rough equivalent of 36 double-sided floppies, or 72 single-sided ones. That's storage, all right.

The system comes with the hard disk itself, which replaces floppy B in your system, a separate power supply to run it (no drain on the PC's supply), associated cabling, software to modify PC-DOS so you can use it and a thorough and complete installation/instruction manual. At 12M of storage, those 72 floppies are costing you $2695. Divided by 72, it comes out to $37.43 per disk drive equivalent, a massive saving.

OK, where's the catch? Nobody has enough storage, and this is awfully cheap on a comparison basis. Well, there are several catches. First, you'll give up your second floppy (which isn't much of a sacrifice, you might say). However, this does mean you can't use packages requiring a copy-protected load from two disks, such as, for example, the Context Management Systems MBA.

But that's not really a loss, since Context MBA is written in UCSD Pascal and Davong's disk currently doesn't support anything but DOS. Support apparently is on the way, but for now, bye-bye Pascal. Also, having a hard disk in no way means you don't have to back it up—quite the opposite, since when hard disks crash (a rare event) they do so very completely. So you'll still need that floppy for occasional dumps off the hard disk.

What do I think of the system? I think it's great, and if you program/run applications mostly under DOS, you should consider at least their 5M disk if not this 12M monster. (Physically, the 5M and 12M units are the same size—the differences are internal.) I think that, when they support Pascal, and as prices continue to fall (although this is cheap for a hard disk), this will be a standard configuration for a PC along with about 1 megabyte of RAM. But right now you'll be trading off some flexibility for the additional storage, and your applications should make that choice for you. I'll have more on the Davong disk next month, after I've used it for a while.

What's New?

Plenty, that's what. Let's look at some recent announcements. I'll test what seems useful, and report back to you.

IBM announced a 256K memory upgrade board for the PC. This board, which can be configured as either 64K or 256K, can be installed in a pair (taking two slots) to give you 512K of memory. Why you (or they) would do this is beyond me, since you can already get 576K on a single board.

Additionally, a prototype card for building and testing custom PC attachments has been made available. It also uses a single slot, and will help engineers and hobbyists design new goodies for the 5150.

Finally, IBM announced Microsoft's Decathlon game program for the PC, which simulates a ten-event track and field competition in which up to six players can take part, and which uses animated graphics. It's all available at your authorized IBM dealer. Prices for the memory expansion, the prototype card and the game are $475, $45 and $35, respectively.

Outside vendors have been busy too, mostly in the area of business software. Omicron has announced Plotrax x,y—a plotting and statistics package for the PC retailing at $250.

Color Corporation announced a $498 ColorBIZ inventory package, which apparently has a report generator and complex graphics generation capability. Sorry to be vague about this, but you ought to try to read their press release!

Professional Micro Systems has made the entire Accounting Plus integrated accounting package available on the PC. I'll let you know more in an upcoming column.

Hardware folks have been busy too. Quadram announced a $995 "all on one" card for the PC, which includes 256K of memory expansion, an RS-232 asynchronous communications interface, a parallel printer port and a clock calendar.

Columbia MicroSystems, Inc., has announced a 2.4M eight-inch disk system for the PC, plus software that supports DOS as well as CP/M-86 for the "introductory" price of $2095. I've not seen it, but it has gotten good press on The Source.

And, PrintaColor Corporation has introduced the PG-1000 ink-jet printer (no

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Circle 358 on Reader Service card.

price, no statement of software driver availability), which is designed to produce color hard copy for the Personal Computer user.

Finally, Infopro has announced *The Directory of Independent IBM Personal Computer Hardware and Software*, which is priced at $29.95 and is said to contain evaluations on 300 PC applications and peripherals. And, ATC Software will conduct software searches to match your money with the perfect application for the PC for $50, plus $2 for each package that matches the search specifications. You can contact them at ATC Software, R2, Box 448, Estill Springs, TN 37330.

Next Month . . .

In terms of some really 11th hour announcements (they arrived just as I was putting this column to bed), here are a few things to hold you till next month. I'll be looking at another graphics dump program, called Print-Graf, which looks pretty good. We'll look at a fast text editor called Window, and see whether those Basic and DOS "memory jogger" cards are as good as they say. And I'll have a rather long and involved PERT-charting program conversion for you to key in on the 5150.

The following announcements may be of interest to you until then. Sofstar has announced some VisiCalc Real Estate Templates, which include rate-of-return calculations and amortization. A new PConnection modem card ($350) has been released, and it fits inside the PC in an expansion slot. And courtesy of Micro Network Corporation comes a set of slimline 5¼-inch disks (two fit in one slot), plus a big hard disk for the other hole and a customized DOS to run it all. Look, Ma, 1.6M in floppy, and that's *before* I use the 10M hard disk!

Raceman.bas

This month's program (see program listing), a short one because we have very little space left, is an adaptation of a program fragment published in *Creative Computing*, September 1982, page 176. The author of this program was interested in adapting it from the PET to the Atari, which has no Print Tab function and consequently poses a challenge for even simple output formatting.

I wasn't at all interested in that adaptation, but thought the original fragment written for the PET could give you (1) a good demonstration of what the PC interrupt-driven function keys can do, and (2) a little game which you could key in, play with and expand to enhance your own Basic skills.

With the recent release of the IBM Basic compiler, there is little reason for you to learn a "faster" or "better" language than the old Beginner's All-Purpose Symbolic Instruction Code (BASIC) unless you've a mind to.

The program works with a color (set the Color to something interesting, like 5,8,3, before running the program) or a monochrome monitor. In fact, it looks better on the monochrome monitor because scrolling is a little bit better managed by the operating software than on the color units.

Pay special attention to how I've used the cursor up, left and right keys with Key(n) On statement and On Key(n) Gosub lines to drive the little fish-shaped car left, right or straight. Also, get into the habit of using the 25th line for prompts whenever possible. It yields a cleaner screen.

Since I've commented the program heavily, I won't step you through it here. But between now and next month, why don't you try some modifications for fun? On the easy side, see if you can build a character-based explosion visual for the crash sequence, or improve on my rudimentary Sound loops (note the Play "MB" command in the listing, which can be found on page 4-181 of your Basic reference manual and can be used with Sound as well).

On the tougher side, either modify the program to allow two cars to race at once (the second car being controlled with function keys 1, 2 and 3), or, even better, write a graphics-driven implementation of this program that uses Get and Put to animate a race car you've drawn instead of the crude character tabbing in the current program. Send me some good modifications, and we'll publish them.□

```
10 '*****************************   raceman   *****************************
20 '     Adapted for the IBM PC by Thomas V. Bonoma
30 '     -from a program fragment in Creative Computing, September, 1982
40 '             pg 176.
50 '
60 'REQUIRES:  BASICA, either monitor will do, no printer needed
70 '
80 '
90 '
100 CLS: LOCATE 5,35: COLOR 15: PRINT "RACE MAN":COLOR 7
110 PRINT: PRINT: PRINT "All you have to do is to keep your car on the road"
120 PRINT "-a very easy job.  Left cursor to turn left, right for right, up "
130 PRINT "for straight ahead."
140 PRINT:PRINT "Set the speed from 10 (beginner) to 0 (race man)"
150 INPUT SPEED
160 PRINT:PRINT:PRINT:INPUT "HIT ENTER TO START ";TR$
170 M=0
180 CLS
190 B1=20
200 B2=B1+SPEED 'a variable speed device.  Speed increases as SPEED decreases.
210 T=24
220 C$=INKEY$
230 'first, turn off the softkey display...
240 KEY OFF
250 'Now, set cursor keys (up, left, right) for interrupts...
260 KEY(11) ON
270 KEY(12) ON
280 KEY(13) ON
290 'and tell the program where to jump to if they're struck...
300 ON KEY(12) GOSUB 430
310 ON KEY(13) GOSUB 440
320 ON KEY(11) GOSUB 450
330 IF (B1=T) OR (B2=T) THEN 600
340 PRINT TAB(B1);D$;TAB(T);CHR$(232);TAB(B2);D$
350 PLAY "MB" 'play the car sound in the background, while program executes...
360 SOUND 50, 5  'a race car noise...experiment with this!
370 A=INT(RND(1)*5)+1
380 ON A GOSUB 410,420,420,420,410
390 ON B GOSUB 470,460
400 M=M+1: GOTO 290
410 B=1:RETURN
420 B=2:RETURN
430 T=T-1:RETURN 'go left!
440 T=T+1:RETURN 'right
450 T=T:RETURN   'straight!
460 GOSUB 550:RETURN
470 Y=INT(RND(1)*3)+1
480 IF X=Y THEN 470
490 X=Y
500 IF X=1 THEN D$="/" 'these were used in the original...
510 IF X=2 THEN D$="I" 'you could be more creative with IBM graphics chars,
520 IF X=3 THEN D$="\" 'but, I wasn't...
530 GOSUB 550
540 RETURN
550 B1=B1+X-2
560 IF B1<1 THEN B1=1
570 B2=B1+10 '10 is the width of the roadway, obviously...
580 IF B2>75 THEN B1=29: GOTO 570
590 RETURN
600 SOUND 50,0: PRINT TAB(T);"***  CRASH!!!":FOR I=1 TO 20: SOUND 90+I,1:NEXT
    I
610 'print the crash sound, but first, turn off the motor sound (SOUND 50,0)
620 LOCATE 25,1:COLOR 15
630 PRINT "You scored ";M;" points."
640 FOR I=1 TO 500: NEXT I
650 COLOR 7: LOCATE 25,1: PRINT SPC(78);: LOCATE 1,1: GOSUB 670
670 FOR I=1 TO 500:NEXT I
680 CLS
690 PRINT:PRINT "Want to try again?"
700 INPUT TR$
710 IF LEFT$(TR$,1)="Y" OR LEFT$(TR$,1)="y" THEN M=0:GOTO 180 ELSE KEY ON: END
720 'always leave things the way you found them...
```

Program listing. Video display routine formatted for the IBM PC, from a fragment published in Creative Computing.

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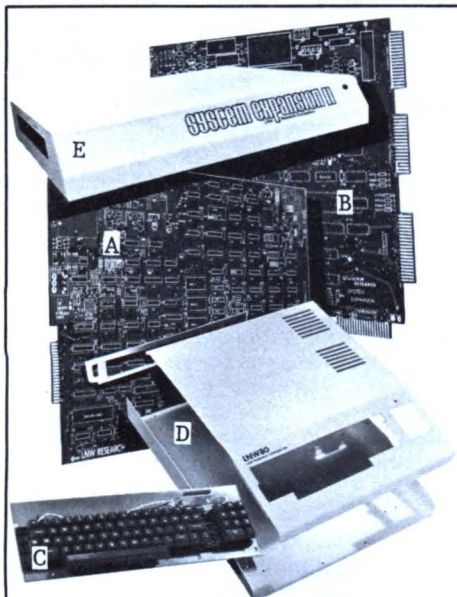

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Maximize Your Disks

Disk Tips, HES Software For the VIC

Hints

When dealing with disk data files, it's nice to be able to tell if a specific file already exists before trying to scratch or open it.

With this information available, a program can give its user the option of using another filename prior to automatically scratching a wrong file. How many times have you mistyped a filename and had something disappear? Well, the following line will tell you if a disk file exists without knowing the file type:

```
COPY D(DN),(FS) TO (FS)
```

DN equals the drive number (0 or 1) and FS contains the filename to be tested. This command attempts to copy the file to itself on the same drive but the actual copy can never be done with the current DOS 2.x versions.

The command will always return a disk error with a disk status of 62 (file not found) or 63 (file exists) in the DS variable. Any other disk status indicates a true disk error occurred.

Thus, by attempting the dummy copy command and checking the contents of DS, you can quickly determine if a file exists without destroying it or knowing what type of file it is.

Here's a quick test to determine the display screen size from within a program, without depending on the ROM versions.

```
100 SS = 40: C = PEEK(32768)
110 POKE 32768 + 1024,(C + 1) AND 255
120 IF PEEK(32768) = C THEN SS = 80
```

The final value of SS will indicate the screen size. (Of course, the test can be condensed to a single line if desired.) It checks the screen width by accessing the first screen location and 1024 bytes from the first location.

On a 40-column PET they both will reference the first location of the screen memory. On an 80-column CBM they both will be unique locations. So it's easy to tell what screen size exists by checking whether the location changes when written with a different value.

This will only work on PET and CBM models, and may not work on the FAT-40 systems (the 40-column machines with 12-inch display screens instead of the original 9-inch screens).

Commodore's 8250 Disk

Anyone with one of the new 8250 disks from Commodore will find few changes from the 8050 disk format (if you've investigated the internal disk structure). On the 8050 you have a directory header block at track 39, sector 0. The BAM resides on track 38, sectors 0 and 3 and the directory starts on track 39, sector 1. With the 8250 format, two more BAM blocks are added to track 38, sectors 6 and 9.

Certain disk utility programs, such as the Disk Master (*Microcomputing*, June 1982, p. 56), will have to work a little more to distinguish between an 8050 and an 8250 disk, since the same format code (2C) is used on both disks.

If you read the directory information as a sequential data file (filename of $0 or $1), a change in data type will show when the BAM ends and the directory starts. For normal everyday usage, the new disk looks like an extra big 8050 or a small hard disk. Luckily, all the disks look the same for normal program data files, program saves and program loads.

Disk Master Additions

Robert Davis of Pennington, NJ, wrote in with a few changes/additions for Disk Master when it's run on a SuperPET. Since I don't have access to a SuperPET, I wasn't able to check his comments, but I thought they were worthwhile enough to pass along.

The Waterloo system uses standard ASCII codes, not Commodore character codes. Also, all filenames are in lowercase. When using the Commodore directory commands (or the Disk Master program) with Waterloo files, you'll get an interesting series of symbols and graphics.

The modifications to Disk Master (Listing 1) will convert the Waterloo ASCII lowercase letters to uppercase and provide a readable printout. The addition at the end of the new line 645 will help you to avoid the problem of trying to read the ASC value of a null character.

New line 646 tests to see if the filename is in lowercase and goes to the conversion routine if true. New line 647 is just the continuation of the original line 645. The conversion routine is located at lines 4000–4040.

```
645 FS = CS:Y = 2:GOSUB 210:Y = 16:GOSUB 200:IF S$ = "" GOTO 647
646 IF ASC(S$)>96 GOTO 4000
647 Y = 9:GOSUB 210

4000 WW$ = S$:S$ = ""
4010 FOR WX = 1 TO 16: WY$ = MID$(WW$,WX,1): WZ = ASC(WY$)
4020 IF (WZ>96) AND (WZ<128) THEN WZ = WZ - 32
4030 WY$ = CHR$(WZ):S$ = S$ + WY$: NEXT WX
4040 GOTO 647
```

Listing 1. Modifications to Disk Master conversion of Waterloo ASCII lowercase letters to uppercase letters.

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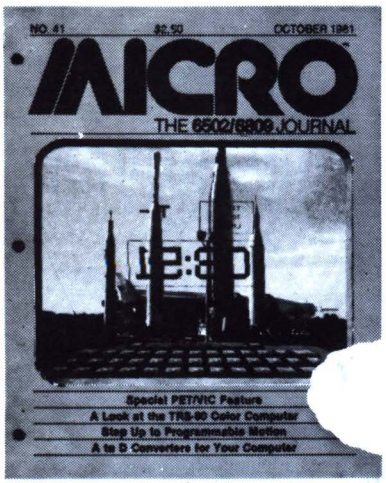

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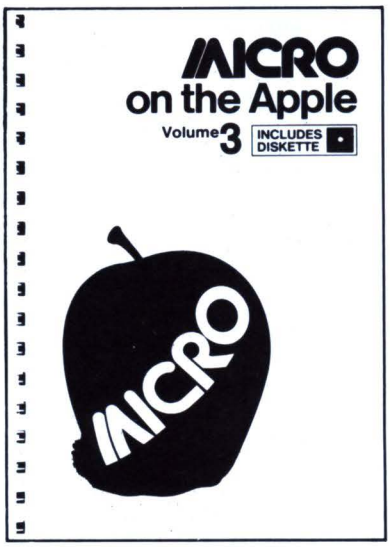

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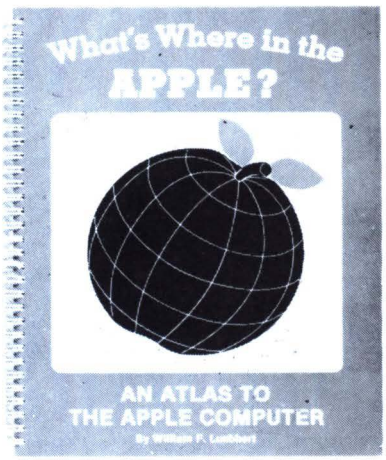

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quality software for Commodore systems. They're now offering a number of programs for the VIC-20, including games, utilities and languages.

HES's programs are professionally packaged for display and make excellent use of the VIC features. Most of the games come on cassette tape, while many of the better programs are provided on ROM in plug-in cartridges. I haven't seen the pricing yet, but it should be reasonable.

Most of the games come on cassette tape. The tapes are on blister-pack cards with the normal loading instructions on the back. The game's name and machine requirements appear on the front but, surprisingly, there is no description of the game anywhere on the card. Printed instructions are also missing.

Each game is actually two program files on tape. The first file provides the program instructions, then loads and runs the actual program file that follows.

Displayed instructions are brief but provide enough information for you to play the game. All of the games, which are written in Basic, have good graphics and sound effects and normally use a joystick for control.

Tank Wars pits you against the VIC in a shooting match. The joystick is used for control as you steer clear of trees, mines and a lake. Play action is tricky to control because the tanks move quickly.

Dam Bomber features the usual format—your plane tries to destroy a dam protected by an antiaircraft gun that shoots back at you. This one is simple to play but tough to master.

Tank Trap is something like Surround. You try to trap the VIC's tank by leaving pylons with your tank. Higher-skill level features include civilians you have to protect from being run over and weak pylons that don't always trap the tank.

Maze of Mikor is a simple adventure-type game. You search the maze for gold or magic rings while watching for a wandering demon. You have a rifle for protection and dynamite for blasting. Like Tank Trap, this game looks easy but is tough to play. (By the way, the colored display instructions are hard to read on some television sets; you may want to modify the program to make them clearer.)

Pak Bomber is something like Activision's Kaboom or the arcade Avalanche game. You try to catch falling objects with a single paddle. This game allows either keyboard or joystick control, even though the brief instructions don't mention the joystick.

Skier turned out to be my son's favorite game. As you're skiing down a mountain, you try to hit the flags while avoiding bumps, trees and ice patches.

Hitting an ice patch causes you to lose control for a second while your skier skids across the mountain sidewise. Hitting a tree kills one of your three skiers, although an ambulance comes to the rescue. Graphics, sound and game play are excellent, but it takes practice to be able to hit the flags.

Aggressor is a less-complicated Defender-type game. Play action, sound and graphics are excellent. My copy was a prototype with preliminary, printed instructions. The final version should include a fancy instruction booklet with the cartridge.

Turtle Graphics is an excellent package written by David Malmberg, an author in the educational field.

For those unfamiliar with Turtle, it's a simple-to-learn computer language that enables the beginning programmer to master the computer in just a few minutes. By telling an imaginary turtle where to roam on the screen, the Turtle programmer can create colorful and artistic pictures. Turtle is an innovative way for children to enhance math, logic, communication and artistic skills as well as computer awareness.

Turtle has most of the key features of the Logo language, but at a fraction of the cost. There are over 30 different commands—for color, sound, motion, logical conditions, calculations, branching and subroutines.

Programs can be listed on a printer, saved or loaded from tape or disk. It's menu-driven for ease of use and has an optional trace mode to help the beginning programmer follow the logic of his program one step at a time. The 72-page instruction manual provides plenty of examples, sample programs and additional references.

Other cartridges from HES include the HES Mon machine language monitor, HES Writer word processor and VIC Forth language. More about these in a later column.

Newsletters

With the increasing number of VIC-20 sales and the Commodore-64 hitting the scene, more and more newsletters are announced every day.

The Byte House recently announced a new publication called "VIC-NIC-NEWS." Each issue will contain news items, programs, information and advertisements pertaining only to the VIC. The intent is to make available a common place to exchange ideas, programs and products and to help people form VIC user's groups.

For a free sample copy, write The Byte House, Box 981, Salem, NH 03079, and include a 20-cent stamp to cover postage. Subscription rates will be $6 per year.

The VIC International Computer Knowledge Information Exchange, VICKIE, was recently formed as an international clearinghouse and newsletter devoted not only to the VIC-20, but also the Commodore-64 and Max computers.

Newsletter articles will include tutorials on Basic and assembly computer languages, hardware modifications and reviews of software and accessories for the VIC series.

VICKIE also will serve the needs of clubs, acting as a coordinating body to avoid duplication of effort in production of larger projects.

Membership in VICKIE will be $20 per year, $17.50 for students. Club affiliations will be based on the number of members. For further information, contact John L. Rosengarten, President, VICKIE, 3822 N. Bell Ave., Chicago, IL 60618. Sample newsletters will be available for a $1 donation.

By the way, the VICKIE newsletter provided Listing 2, which is a correction to the Hires Graphics demo program in the *VIC-20 Programmer's Reference Guide* (pages 88–91). If you look through the book, you'll notice several wrong line numbers as they present the program in pieces. So here's a complete program listing with the appropriate corrections.

Note that this program is set to run on an unexpanded VIC. If you have any memory expansion cartridges installed, it will not function properly.□

```
  5 POKE 36869,255
 10 POKE 36879,8: PRINT "□": REM SHIFTED CLR/HOME
 20 FOR L=0 TO 7: FOR M=0 TO 7
 30 POKE 7680+M*22+L,L*8+M
 40 NEXT: NEXT
 50 FOR I=7168 TO 7679: POKE I,0: NEXT
 55 FOR X=0 TO 63
 60 Y=INT(32+31*SIN(X/10))
 70 CH=INT(X/8)*8+INT(Y/8)
 80 RO=(Y/8-INT(Y/8))*8
 90 BY=7168+8*CH+RO
100 BI=7-(X-(INT(X/8)*8))
110 POKE BY,PEEK(BY) OR (2↑BI)
120 NEXT
130 FOR T=1 TO 5000: NEXT: GOTO 50
```

Listing 2. Corrected version to the Hires Graphics demo program in the VIC-20 Programmer's Reference Guide.

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents a collection of capsulized software reviews from various computer-related publications. Micro Software Digest is presented in an index-card format; so read on and clip and keep your favorites.

ATARI

Paint

System Requirements: Atari 400/800 with 48K, disk drive and color television or monitor
Manufacturer: Reston Publishing Company, 11480 Sunset Hills Road, Reston, VA 22090
Price: $39.95
Comments: Paint is a program making it possible for Atari users "to explore some of the rich possibilities open to computer artists at an astonishingly affordable price," states the review.

"Paint is to painting what word processing is to writing," says the review. "If you're seriously inclined to explore the world of computer imaging, this software package might make it well worth your while to invest in an Atari."
Reader Service Number 428

(Reviewed in Softside, *October, 1982)*

(Reviewed in Softside, *October, 1982)*

ATARI

Draw Pic

System Requirements: Atari 400/800, Atari Basic Cartridge, 16K cassette, 24K disk
Manufacturer: Artworx Software Company, 150 North Main Street, Fairport, NY 14450
Price: $29.95 Cassette; $33.95 Disk
Comments: Draw Pic is a graphics utility, which, according to the review, "makes it possible for the casual user (or hobbyist) to create part or full-screen images in Graphics modes 3-7. These images can then be stored for later viewing or changes."

"An admirable job of constructing a great utility," says the review, "well worth its price and a favor to Basic programmers."
Reader Service Number 427

(Reviewed in Softside, *October, 1982)*

COMMODORE

Solicube

System Requirements: Commodore computer with 16K RAM, 40-column screen and disk
Manufacturer: Comquest, 221 E. Camelback, Suite 1, Phoenix, AZ 85012
Price: $50, plus $3 shipping
Comments: "This general-purpose Rubik's Cube solver program includes a Rubik's Cube," the review states. "Graphics and CB2 sound are used to display movements and speed solution."

"Surely the best program now available to Commodore users," says the review, "Solicube aims to teach users to solve their own cube problems."
Reader Service Number 432

(Reviewed in Micro, *October, 1982)*

IBM

Advanced System Editor

System Requirements: IBM PC or Apple II
Manufacturer: Volition Systems, P.O. Box 1236, Del Mar, CA 92014
Price: $175
Comments: "The Advanced System Editor, a screen editor, provides user-defined function keys that can run on the IBM Personal Computer and the Apple II," says the review. "Features include the ability to edit large files, function keys that can be easily trained, file selection by a menu, the ability to edit a new file while still within another, and simplified keystroke sequences."
Reader Service Number 429

(Reviewed in Personal Computing, *October, 1982)*

(Reviewed in Personal Computing, *October, 1982)*

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ATARI

3-D Supergraphics

System Requirements: Atari 400/800 with 40K, cassette or disk
Manufacturer: United Software of America, 750 Third Ave., New York, NY 10017
Price: $39.95
Comments: 3-D Supergraphics is a package which "allows the creation and manipulation of 3-D shapes using Basic Print# commands," according to the review.

The program was originally written for the Apple, so a four-page appendix to the manual notes system specific differences and loading instructions for the Atari. Aside from this drawback, the review says, "This program is one of the few packages which really takes advantage of the graphics capabilities of the Atari."
Reader Service Number 433

(Reviewed in Softside, *October, 1982)*

HEATH

ZenCalc 2.0

System Requirements: Heath/Zenith H-89, Z-89 or Z-90 computer or H-19 or Z-19 terminal, HDOS or CP/M, 48K RAM (more recommended), one 5¼-inch or 8-inch (CP/M only) drive
Manufacturer: The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423
Price: $99.95
Comments: ZenCalc is a program generating a spreadsheet with 52 columns and 255 rows. However, says the review, "the number of positions you can fill depends on the memory of your computer. . . With ZenCalc, 500 positions are the maximum you can expect to fill with a 48K system."

The reviewer "found the commands and operations to be logical and therefore quite easy to remember and use. If you are a novice with little or no mathematical aptitude, though, you will probably not get the maximum use from ZenCalc without thorough study of the documentation and quite a bit of practice."
Reader Service Number 406

(Reviewed in InfoWorld *October 4, 1982)*

APPLE

This product appeared in the Micro Software Digest section of the October Microcomputing; *however, there was an error in the listing of the manufacturer. Here is the corrected version:*

Super Copy Disk III

System Requirements: Apple II, 48K, Disk II, DOS 3.3
Manufacturer: Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033
Price: $30
Comments: "Super Copy Disk III is a smooth, easy to use, powerful and well-thought-out utility for getting control characters out of your catalog names, 'undeleting' files and removing DOS from a diskette," according to the review.

"The program can be used with a single drive; it is really designed for two," the review says.

"The program is completely self-prompting and obvious after only a few sessions," according to the review.
Reader Service Number 435.

(Reviewed in Peelings II, *March 1982)*

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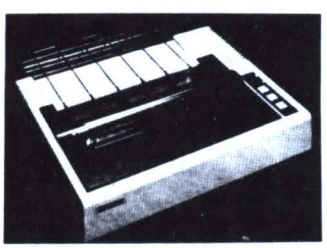

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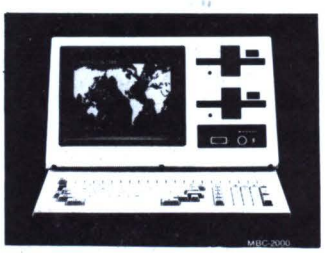

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APPLE

Amper-Magic

System Requirements: Apple II with Applesoft in ROM or language card, DOS 3.3, 48K RAM, one disk drive
Manufacturer: Anthro-digital, 103 Bartlett Ave., Pittsfield, MA 01201
Price: $75
Comments: "Amper-Magic," according to the review, "is a combined Applesoft and machine-language utility that adds machine-language routines to your Applesoft program. The programmer does not need to know machine-language or Applesoft internals. Twenty-three routines are included."

"Amper-Magic worked as advertised," the review stated. "Anthro-digital intends to bring out additional routines to load with Amper-Magic. It seems a little overpriced, considering the number of useful routines I would use. On the other hand, it easily incorporates machine-language routines with Applesoft."
Reader Service Number 407

(Reviewed in InfoWorld, *October 4, 1982)*

APPLE

Keno Master

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Telephone Software Connection, Box 6548, Torrance, CA 90504
Price: $25
Comments: This is a computer version of the gambling game, Keno, in which you win by matching your preselected numbers with numbers drawn at random from a much larger set. How much you win depends on the percentage of successful matches.

The review says, "This version of the game is clear and straightforward with on-disk, easy-to-follow instructions. . . an inexpensive, fun game that clues you in on why the world has played Keno in one version or another since 1530."
Reader Service Number 424

(Reviewed in Softalk, *September, 1982)*

APPLE

Air Navigation Trainer

System Requirements: Apple II or II Plus, Applesoft with DOS 3.3, 48K RAM, one disk drive, paddles
Manufacturer: Space-Time Associates, 20-39 Country Club Drive, Manchester, NH 03102
Price: $40
Comments: "Air Navigation Trainer demonstrates the effect of wind on heading and ground track and gives you a chance to improve your navigational abilities," says the review. In each of four games, "you take off, navigate to a specific point and land."

"Air Navigation Trainer," according to the review, "is not an extremely sophisticated aircraft-navigation simulator, but it is a nice game for the nonpilot and a good learning tool to increase the agility of the experienced pilot."
Reader Service Number 405

(Reviewed in InfoWorld, *September 20, 1982)*

APPLE

Computer Power

System Requirements: Apple II or II Plus, DOS 3.3, Apple Pascal Version 1.1 and Pascal keychip, 48K RAM, 16K RAM Card or Apple Language Card, one disk drive, color monitor, game paddles
Manufacturer: Gentleware Corporation, Box 8301, University Station, Knoxville, TN 37916
Price: $385 (Teacher's manual and Rascal/INTERPAS interpreter) $7.50 (Student text)
Comments: The review states that "Computer Power is an introductory programming curriculum for junior-high, high-school and junior-college students. It uses Rascal, which is a cartoon-animation dialect of Pascal."

Computer Power is designed as an 18 week course, with detailed lesson plans for each day of instruction. "Teachers who have little computer experience," says the review, "can use this package as they can learn along with their students. . . Computer Power is a valuable teaching tool that requires a substantial commitment in hardware and teacher training."
Reader Service Number 408

(Reviewed in InfoWorld, *October 4, 1982)*

APPLE

Zork III

System Requirements: Apple II with 48K, ROM Applesoft and one disk drive
Manufacturer: Infocom, 55 Wheeler Street, Cambridge, MA 02138
Price: $39.95
Comments: Zork III is a text adventure, which, says the review, "is filled with well-written descriptions of imaginatively delightful and curious places."

"Although plot is not its forte," the review concludes, "Zork III has a theme, morals and meaning. It's a masterpiece of logic that demands that you think. No adventurer—or game-enjoying thinker—should be without it."
Reader Service Number 409

(Reviewed in Softalk, *September, 1982)*

APPLE

Cytron Masters

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Strategic Simulations, 465 Fairchild Drive, Suite 108, Mountain View, CA 94034
Price: $39.95
Comments: "The premise behind this game," states the review, "is that humanity has advanced to a stage where conventional war between human combatants is either threatening to race survival or considered abhorrent by a more enlightened society than our own." Therefore, the war in this game is waged by robots, and the player is the manager.

The review says that the game comes with a brief but complete manual and a fine tutorial program. "Cytron Masters gets a high rating in playability, intelligence and excitement," concludes the review.
Reader Service Number 411

(Reviewed in Softalk, *September, 1982)*

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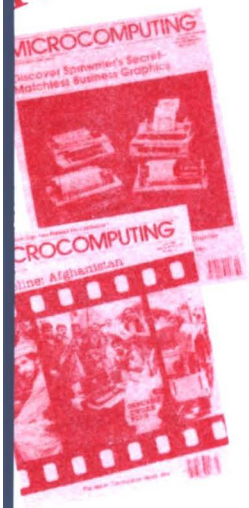

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APPLE

Russian Disk

System Requirements: Apple II or II Plus, DOS, 32K RAM, one disk drive
Manufacturer: Instant Software, Inc., Peterborough, NH 03458
Price: $24.95
Comments: The Russian Disk teaches the Russian alphabet, pronunciation and everyday phrases. "You can use it," the review says, "as a personal tutorial . . . or as an instructional classroom tool to teach beginning Russian."

"It gives no rules of grammar or formal evaluation, but it does supply users with a great deal of information," the review states. "It is enjoyable to use . . . and educators should be especially pleased to see quality software at such a reasonable price."
Reader Service Number 402

(Reviewed in InfoWorld, *September 20, 1982)*

APPLE

Dueling Digits

System Requirements: Apple II or II Plus, DOS 3.2 or 3.3, 48K RAM, one disk drive, game paddles or joystick
Manufacturer: Broderbund Software, Inc., Entertainment Software Division, 1938 Front Street, San Rafael, CA 94901
Price: $29.95
Comments: According to the review, "Dueling Digits is an unusually effective arcade-style game that teaches as it excites and entertains." The object is for each player to capture numbers and mathematical symbols of operation and from them form correct equations.

"Unfortunately," states the review, "the genre is still 'shoot-em-up', though significantly played down in the two-person mode . . . This is an excellent educational game. Hopefully, the authors, and other game makers, can begin to create games based on constructive, rather than destructive, premises."
Reader Service Number 403

(Reviewed in Classroom Computer News, *September/October, 1982)*

APPLE

Business Bookkeeping System

System Requirements: Apple II, II Plus or III, with two disk drives and a printer
Manufacturer: Dakin 5 Corporation, PO Box 21187, Denver, CO 80221
Price: $395
Comments: According to the review, "Business Bookkeeping System is a new cash-basis accounting system for small businesses. This set of menu-driven ledgers features more rapid data entry than found in conventional accrual accounting systems. It is also designed to let users switch to an accrual system at a later date with no loss of previously entered information."
Reader Service Number 430

(Reviewed in Personal Computing, *October, 1982)*

APPLE

BirdBreed

System Requirements: Apple II Plus or Apple II with Applesoft, DOS 3.2 or 3.3, 48K RAM, one disk drive
Manufacturer: EduTech, 634 Commonwealth Ave., Newton Centre, MA 02159
Price: $95
Comments: The review praises BirdBreed as an educational program designed to "allow students to explore genetic principles."

"BirdBreed," the review states, "lets you see genetics in action . . . (It) is what every educational software product should be—a software product that is more than an electronic textbook. It is, however, clearly intended for the classroom. A parent would need a basic knowledge of genetics to use BirdBreed correctly with children."
Reader Service Number 401

(Reviewed in InfoWorld, *September 20, 1982)*

APPLE

Quick File III

System Requirements: Apple III with at least 128K of RAM
Manufacturer: Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014
Price: $100
Comments: "Apple Computer's Quick File III," says the review, "is an easy-to-use filing system for managing small- to medium-size collections of information on the Apple III personal computer."

"Quick File III allows for simple arrangement of records in alphabetic, numeric, date or time order, and saves time and effort in producing repetitive reports, calculations and corrections," according to the review.
Reader Service Number 431

(Reviewed in Personal Computing, *October, 1982)*

APPLE

Chuckles' Laf Pak

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive, paddles
Manufacturer: Sierra On-Line, 36575 Mudge Ranch Road, Coarsegold, CA 93614
Price: $34.94
Comments: Chuckles' Laf-Pak is a game disk—but actually four games in one package. "Perhaps On-Line was just feeling generous," says the review, "when they put together this package. These are fast, tight little games, presenting a lot of action in limited space."

First, Creepy Corridors, a maze with diamonds, then Apple Zap, a space station and alien shooting game, followed by Space Race, with rocket ships and bats and finally Mine Sweep, in which you try to blast away a mesh screen.
Reader Service Number 426

(Reviewed in Softalk, September, 1982)

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APPLE IBM PC TRS-80

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APPLE

Wordrace

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Don't Ask Software, 2265 Westwood Boulevard, Los Angeles, CA 90064
Price: $19.95
Comments: According to the review, "Wordrace is a demanding educational game that will tax your vocabulary to the limit. A word and six possible definitions appear on the screen . . . You scan the list frantically to find the corresponding definition."

Wordrace offers three levels of difficulty, and, says the review, "you'll have built up quite a vocabulary yourself by the time the words and definitions start to repeat."
Reader Service Number 416

(Reviewed in Softalk, *September, 1982)*

APPLE

Prom-It EPROM Development System

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: MPC Peripherals Corporation, 9424 Chesapeake Drive, San Diego, CA 92123
Price: $129.50
Comments: This package, according to the review, "includes a powerful programming board that doubles as a PROM expansion board. Personality modules allow the Prom-It to work with a large variety of devices. Completing the system is an easy-to-use, menu-driven program that controls all aspects of the EPROM programming process."

"All in all," says the review, "this is a fine product. The documentation consists of a 30 page manual that's fairly complete and simple. Considering the nature of the product and its probable users, this is more than adequate."
Reader Service Number 419

(Reviewed in Softalk, *September 1982)*

APPLE

Peachy Writer

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive and printer
Manufacturer: Cross Educational Software, Box 1536, Ruston, LA 71270
Price: $24.95
Comments: Peachy Writer is "a word processor reduced to the absolute minimum," states the review, "with the emphasis on ease of learning. The manual calls it a 'text editor' . . . but it also has disk management routines (store, retrieve, delete and catalog), a printer formatting menu and a useful help file. Not bad for less than 30 dollars!"

"Needless to say, it has some weaknesses," says the review, "but considered as an answer to the question, 'What is the least that an intelligent, careful person could get by with, if he didn't have to use it very often?' Peachy Writer is a well-chosen set of compromises."
Reader Service Number 423

(Reviewed in Softalk, *September, 1982)*

APPLE

Personal Inventory

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: 8th Dimension Enterprises, Box 62366, Sunnyvale, CA 94088
Price: $59.95 (Backup disk included)
Comments: "Personal Inventory is not a database management system," according to the review. "Instead, it is a set of customized file managers for recording and relating information in seven specific subjects (magazines, technical subjects, books, computer programs, house items, jewelry and tools.) The advantage to this approach to managing data is that the work of setting up the database is already done."

The review concludes that "The list of subjects seems just right for the novice home user, someone trying to find uses for their new computer, and this is probably the market for which this product was designed."
Reader Service Number 415

(Reviewed in Softalk, *September, 1982)*

APPLE

VisiCalc Formatting Aids

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Data Security Concepts, Box 31044, Des Peres, MO 63131
Price: $44.95
Comments: According to the review, "VisiCalc Formatting Aids is a product that can be of use to any VisiCalc user. A purchaser receives a disk, a ten-page manual and a two-page tutorial." The package offers four program options: the Label Splitter, Formula Reader, Print File Reader and Variable Width Reader.

"VisiCalc Formatting Aids is a very useful product," says the review, "for those people who are trying to accomplish what this product does well: providing flexibility and added features to VisiCalc."
Reader Service Number 413

(Reviewed in Softalk, *September, 1982)*

APPLE

Snooper Troops: The Granite Point Ghost

System Requirements: Apple II with 48K, ROM Applesoft with one disk drive
Manufacturer: Spinnaker Software, 215 First Street, Cambridge, MA 02142
Price: $44.95
Comments: "The second major entry into the mystery field for micros," says the review, "comes in the form of an educational game. The Granite Point Ghost is intended to be the first of a line of mystery games in which the solvers are called the Snooper Troops."

"Although the Snooper Troops format is definitely educational and worthy of a place in every fourth-grade through eighth-grade classroom, it's also great fun," states the review. "It is enjoyable, colorful, of trade quality and an excellent educational tool. It's a good mystery, too."
Reader Service Number 412

(Reviewed in Softalk, *September, 1982)*

Classroom Computer News, 341 Mt. Auburn St., Watertown, MA 02172; $12 annually, six issues.
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Softalk, 11021 Magnolia Blvd., North Hollywood, CA 91601; $24 annually, 12 issues.
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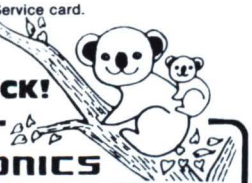

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Rx for Your Disk Drive Ills

If major surgery is not necessary for your disk drives, you may at least want to consider a regular schedule of maintenance to ensure drive reliability.

By Kirk L. Thompson

My two-drive Heath H89/H77 system was giving me fits.

At first, I began getting increasing numbers of soft (recoverable) errors. They occurred on the innermost tracks of my disks.

Running "Checksum" before booting showed "?00 *ERROR*" before most of the ten-sector blocks from tracks 35 to 39. After booting, STAT, the system status routine under Heath's Disk Operating System (HDOS), version 1.6, displayed as many as 32,000 soft errors! Those graduated to as many as 30 hard (unrecoverable) errors.

About that time, I bought the H14 printer. After assembly and debugging, my system would not recognize the H14, even though my commands to it were correct. I could only get a "?02 UNKNOWN DEVICE NAME" error message.

I tried preparing a new copy of the

Address correspondence to Kirk L. Thompson, Box 25, Route 1, Oxford, IA 52322.

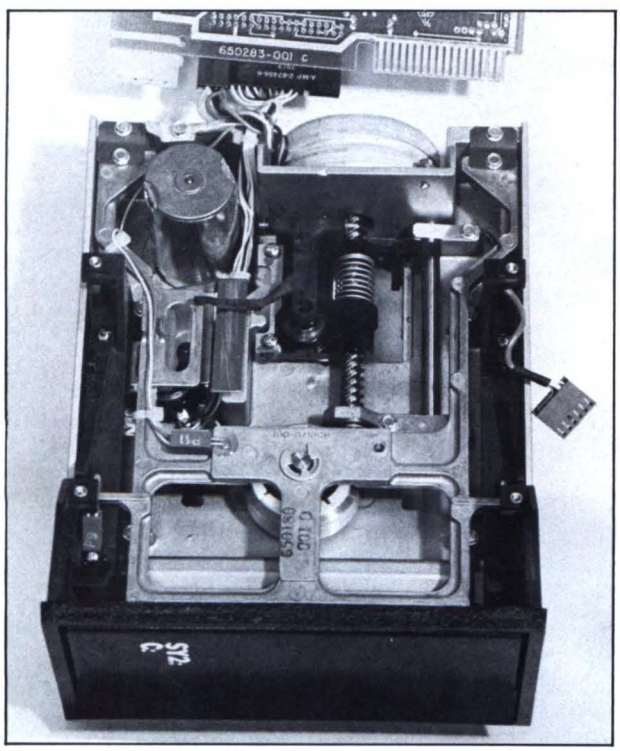


Photo 1. The drive's worm gear is now ready for cleaning. Note that the head carriage is against the lower stop, just to the left of the head.

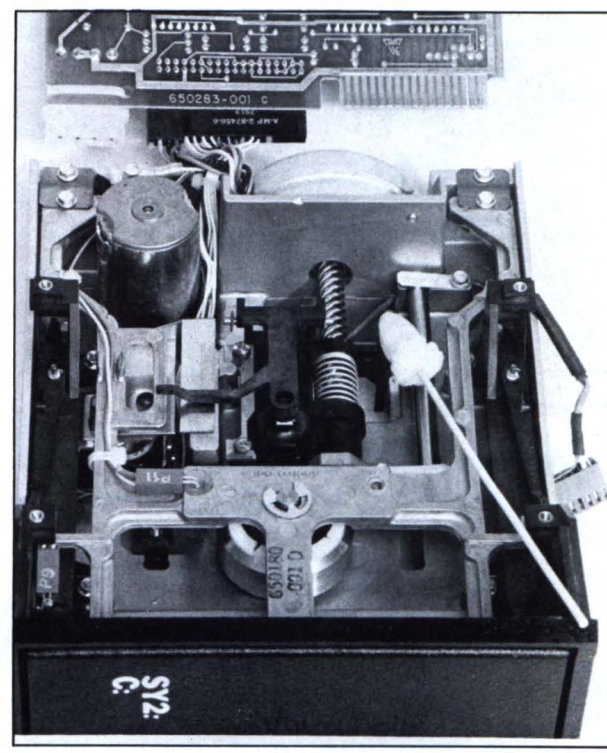


Photo 2. Halfway through the cleaning. Notice that the head carriage is now against the upper stop.

original system software, suspecting that the problem might be with my older disks. But the system distribution disk from Heath wouldn't even boot.

As system reliability deteriorated, so did drive step time. The main drive would not even pass the 36 millisecond seek time check in the drive test program (TEST). Setting step time to 40 ms, using SET SY: STEP 40, helped some. Interchanging the drives between the H89 and H77 also helped, but only because the latter was newer.

By this time, the original drive from the H89 was 1¼ years old and the drive in the H77 was six months old.

Finally, I got tired of fighting with the drives and shipped both back to Heath's service department to be checked. Then I ordered a third drive.

Meanwhile, Heath had found nothing wrong with the first drives. And since I had received the latest release (2.0) of HDOS, I decided to give it a try.

With some difficulty, I was able to duplicate the basic system software. Running the drive test program, TEST17, still showed hard and soft errors and poor step times, but, at long last, the printer worked. With some progress made, I started converting my disk library to the new version.

Rx: Irrigate the Worm

The break in the problem came in the form of the magazine published by the Heath User's Group. *REMark* No. 17 contained a letter from Greg Green of Victoria, BC, Canada, describing a procedure for cleaning the worm gears of Siemens five-inch drives. I tried it and liked it.

I'll elaborate on Greg's procedure and add some steps I stumbled across while cleaning my own. The procedure works because Siemens uses a graphite lubricant on the gear that gums up.

The procedure is as follows:

1. Dismount the drive from its enclosure and lay it on your work surface with the large circuit board up.

2. Disconnect the five-conductor socket connector on the right side of the board, remove the four mounting screws and fold the circuit board back. (See Photo 1.)

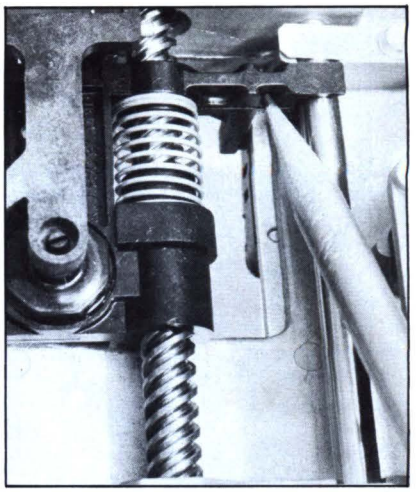


Photo 3. The pencil is pointing at the guide you will aim for through the door of the drive.

3. Soak a foam-type swab intended for video recorders with isopropyl alcohol and clean the exposed ends of the worm gear. Manually move the head carriage along the gear to clean otherwise inaccessible parts of the

Keep Your Disk Drives Humming

By G. Michael Vose
Technical Editor

Your shiny new computer has performed flawlessly for months now. But one day you notice that it takes longer for your word processing program to load in off the disk. A couple of days later, you try to load a file but you receive a "Parity Error" message after some grinding noises tumble out of your drive.

Your first inclination is probably to haul the balky drives to your computer repair center for servicing. But is it possible that there is some kind of service you could perform yourself that might cure the problem? Indeed, is there a program of regular preventative maintenance that you can perform on disk drives to avoid these kinds of problems in the first place?

Let's take a look at what the professionals have to say about disk drive maintenance.

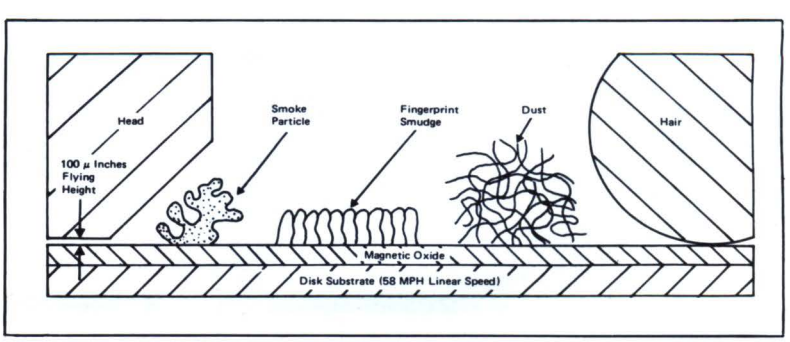
Drive Manufacturers

Most of the companies contacted by *Microcomputing* claim that their products require virtually no preventative maintenance on a day-to-day basis. They all advise a yearly or semiannual checkup by an authorized service representative for disk drive products but try to discourage the performance of preventative maintenance by the casual user.

In fact, Nancy Schilling, a Customer Service Representative of Percom, Inc., claims that 30 to 40 percent of the repair problems encountered by Percom service people are the direct result of improperly-performed preventative maintenance—specifically, the incorrect use of head cleaning kits. Percom does not offer technical publications about its products to the general public and would prefer that users visit an authorized Percom service agent for any and all maintenance.

Craig Wade, a Sales Support Engineer with Siemens Corporation, told *Microcomputing* that "vacuuming the dust out of the cabinet" (where the drives are installed) was about the only preven-

(continued on page 42)



With the disk head flying at 100 μin above the magnetic oxide surface, even seemingly insignificant dust, smoke particles or hair can cause a disastrous head crash. Reprinted from Digital Design, *June 1978.*

gear (see Photo 2). Discard the swab.

4. Apply a Teflon-based lubricant, such as "BREAK-FREE" or "SP-60." You can either carefully spray it on the gear or use a clean swab as a transfer medium. Move the head carriage back and forth to ensure even distribution of the lubricant. When done, be sure to leave the head carriage as far away from you as the built-in stop will allow.

5. With a new swab moistened in alcohol, clean the read-write head and pressure pad.

6. Fold the circuit board back over the head drive and fasten it in place with the screws. Be careful with the socket connector cable. There's a slot in the upper right-hand circuit board mounting post which the cable routes through. Push and hold the cable *all the way* in the slot before threading the mounting screw through and tightening it. Reconnect the polarized socket connector to the board.

7. Remount the drive and test it. If a dirty worm gear was your problem, it should run like new.

A few notes on the procedure: In step 4, the head carriage *must* be positioned as described. During operation, the head always returns to track 0 after a disk dismount; if you don't leave it there after cleaning, the drive will hang up. Nothing short of a system reset will turn it off.

In step 6, that cable with the socket connector is the head cable. If you damage it, the drive won't read or write. I accidently crushed it when I cleaned my first drive and that little mistake cost me $70.

The combination of an older worm gear and the Teflon lubricant also may cause the head carriage to slip off track 0 when the drive is jarred or moved. If this happens while running, reset the system, open the drive door and remove the disk. With a flashlight, locate the head carriage guide.

With a long, eraser-tipped pencil or wooden rod, push the guide back as far as it will go. Then put your disk back in and reboot. (This method can be used any time the drive is moved.)

Stepper Motor Hyperthermia

After I had cleaned the worms on my older drives and installed the new one when it arrived, I was in seventh

(from page 41)

tative maintenance you need to perform on Siemens drives.

Siemens *does* recommend six-month checks by authorized service representatives. They also publish a complete technical specifications manual, including a "Theory of Operations" chapter, for $5.

Wade said that head cleaning should only be performed with "a cue tip and denatured alcohol, although this is tricky for dual-head drives." Wade further reports that the most common cause of failure for Siemens drives is "operator misuse."

At Tandon, Inc., the story was much the same. Maintenance on a regular basis is deemed unnecessary. Tandon drives average 8000 hours of service between failures. A technical representative there advised against the use of cue tips for head cleaning, adding once again that "it's not necessary." Tandon does offer a service manual for $25, available by mail order.

Whither Head Cleaning Kits?

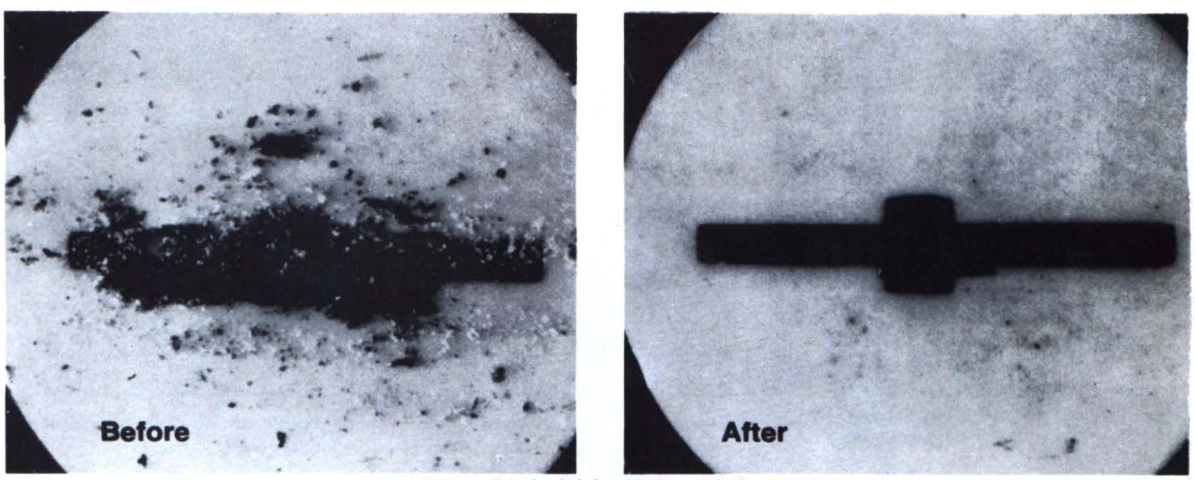
If head cleaning is unnecessary, it certainly would be news to A. H. Packard of Innovative Computer Products in Tarzana, CA. His company, founded in 1976, has grown to be the world's largest manufacturer of floppy disk and Winchester hard disk media and drive head cleaning products.

Under its own brand name, Perfect Data, and as the manufacturer for 15 private labelers, ICP sells thousands of disk drive head cleaning kits every year. In fact, the company's products are recommended by more than 25 computer-product manufacturers—including Tandon and Siemens.

ICP recommends that you clean the heads of your disk drives after every 40 hours of operation. This removes the buildup of oxides and small dirt particles that make it difficult for the head to read the magnetic data on a disk.

Most disk operating systems use a loop of ten read attempts when accessing the data on a floppy disk. If you can detect that your drive is using more than one or two of these read attempts before successfully reading data, then your drive can

(continued on page 44)



Microphotographs of a disk head before and after cleaning.

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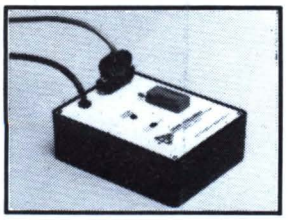

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heaven running three drives!

Two weeks later, though, I was down to one marginal drive. The oldest, as I mentioned, quit reading and writing, so I shipped it off to Independent Peripheral Services (Westlake Village, CA) for repair of the cable.

The new drive zonked out too, so I shipped it back to Heath. And my remaining drive, which I mounted in the H89's cabinet, started showing hard and soft errors and poor step times.

This sounds like an old rerun, right?

Wrong! Recleaning the worm gear did nothing. After consulting with members of the Omaha Heath User's Group, I mounted the drive in the H77 cabinet and that did it.

At this point I recalled that I once felt a warm cabinet near the H89's power supply. Perhaps the most serious difficiency in the H89 is heat removal.

The cabinet was originally designed for the H19 terminal and for that it is adequate. But the additional boards and regulators required for the H89 make cooling marginal. A non-air-conditioned working environment, as mine is, is definitely a problem. This is compounded for the drive because the stepper motor is within inches of the power supply. The noisy, original equipment fan is just not enough when the temperature pushes toward 90 degrees.

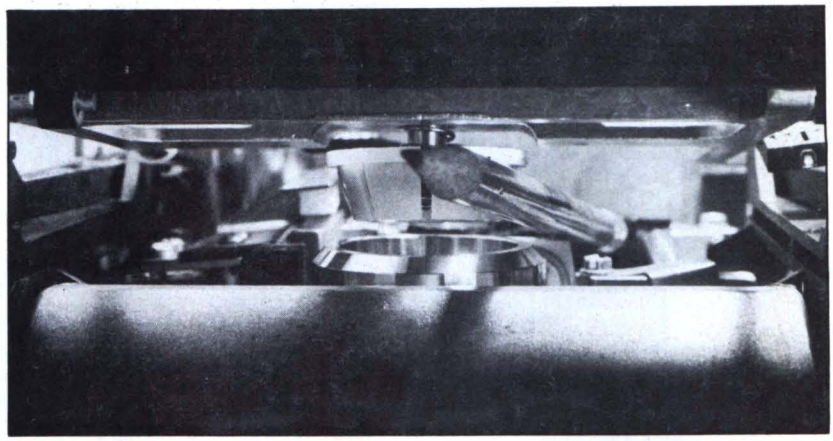

Photo 4. Through the drive's door darkly. The head is protected by the drive spindle.

Rx: Surgery

Realizing that heat was the trouble, I decided on surgery for the cabinet's upper shell. I had two objectives in mind: replace the fan and improve air flow over the drive.

Although I probably could have found a higher-volume direct substitute for the original Pewee Boxer fan, I decided instead to go with a larger one.

One factor in that decision was that a larger fan could rotate at a slower speed and therefore run more quietly. The other was that I already had a Rotron Whisper fan lying around.

The principal disadvantage of a larger fan is that it cannot be mounted completely inside the cabinet. In my case, the Whisper fan overlapped the top of the main circuit boards by several inches. There is also very little clearance between those boards and the inside of the shell, so I arrived at the compromise shown in Photo 5. (I also had to replace the ac connection to the fan, but Molex connectors are easy to come by.)

While making the cut-out for the fan, I discovered that the structural foam from which the cabinet is molded is soft. I would suggest using hand tools for working it. I used a keyhole saw for the major cuts, a metal file for squaring corners and fine sandpaper for cleaning up the edges.

To improve air flow over the drive, I chose the direct approach: 3/8-inch holes drilled in the cabinet's sidewall. I laid out the holes on one-inch centers as a 7 × 4 array; as an afterthought, I added a 2 × 4 array of holes on the opposite side of the shell. This was to provide circulation over the video board and around the filament end of the cathode ray tube.

Be careful when drilling the holes in the shell. The drill bit got warm enough that the plastic shavings clumped and tended to fuse to the

(from page 42)

benefit from a head cleaning.

Ultimately, the real key to successful floppy disk operation is to *handle the disks themselves properly.* Never touch the surface of the disk itself; do not smoke pipes, cigars or cigarettes around exposed disk surfaces; always store disks in their envelopes and in a box of some kind to provide protection from airborne dust; never write on disk labels with a ball-point pen.

All disks are susceptible to dust and dirt, but "80 track floppies, because they record data on narrower tracks, are even more sensitive to dust and smoke," according to Ed Umlor of EJU Enterprises, a computer maintenance and consulting firm in Rindge, NH. Umlor said that most disk drive problems can be avoided simply by storing disks properly, not smoking in the computer room and having a technician check the head alignment every six months for business computers, every year for a home machine.

Umlor also said that you should cover your computer *and* drives when not in use. He warns, however, "Don't close the drive doors; on single-head drives, the head and felt of the head guide come into contact and oxides on the felt will dirty the head. With dual-head drives the heads touch each other, which is a real problem."

What To Do?

So what's the bottom line for you and your disk drives? First, make sure you handle your disks properly. Next, buy a disk drive head cleaning kit and clean the heads on your drives every 40 hours—whether this is necessary may be a matter of opinion, but it certainly can't hurt—and if real serious trouble develops, you'll head for your service center.

One computerphobe in our office swears that the best way to handle a disk that won't load is to "turn it over and boot it upside down—that'll clean off the disk and the head and then you'll be able to put it in the right way and I guarantee it'll load." That advice we'll let *you* evaluate.■

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8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
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72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
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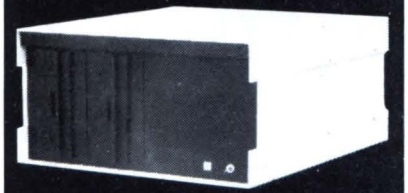

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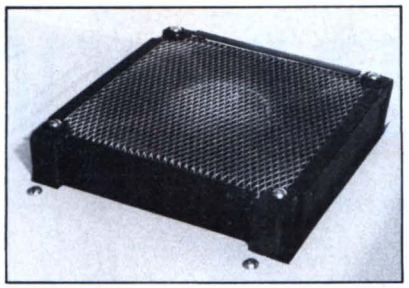

Photo 5. View of the new fan from the outside of the upper shell. Besides being decorative, the vinyl molding around the fan prevents the sharp edges of the expanded metal screen from tearing up vinyl cloth dustcovers.

edges of the holes. I would suggest running the drill in and out several times after breaking through. If the shavings do fuse, they can be removed easily with a sharp knife.

When running the system now, I can feel a draft around my new ventilation holes, and with extended use, the side of the cabinet no longer gets warm. The drive also doesn't show any more errors and the fan is much quieter. The surgery was successful.

Miscellaneous Regimens and Remedies

With my major problems solved, I obviously want to keep trouble permanently at bay. And that means a regular schedule of maintenance.

For one procedure I have already discussed—the worm gear cleaning—I've decided on a semiannual routine. The drive test program included in HDOS is another which I will be running on a before-and-after basis in conjunction with the cleaning. But there are a number of other maintenance procedures which should be done regularly.

The first of these is drive motor speed. With use, the motor bearings wear and affect motor speed, which in turn affects diskette rotation. Heath allows a one percent variation in the rotational speed.

There are two ways of determining drive motor speed: from a subroutine in TEST17 or, for the drive in the H89, from the monitor (by typing Go 7372). I've noticed, though, that the two don't always agree. Since I don't have the equipment to tell me which is the more accurate, I have decided arbitrarily to use the subroutine in TEST17 as my standard.

Whichever is used, a one percent variation can affect drive reliability. As part of routine maintenance, the motor speed should be adjusted as close as possible to nominal.

Another procedure which should be done routinely is read-write head cleaning. Although there are arguments both ways on this, I feel that the home computer, by nature, will be operated in a dirtier environment than the business-oriented minis or the big mainframes. That suggests that something should be done to control dust and grit on the head.

Although dustcovers help, even Heath implicitly admits the possibility of cleaning by including a subroutine for it in TEST17. However, they don't recommend using it as yet. But it's also possible to go too far the other way. The supplier of the cleaning diskette I have suggests using it daily. Siemens, though, doesn't recommend using it at all.

I have discontinued the use of mine and have opted, instead, for the manual approach described under the worm gear cleaning procedure.

A third factor which will improve drive reliability is not directly related to the drives: the use of reinforcing rings on diskettes. Although not exactly cheap, reinforcing rings reduce deformation of the spindle hole.

Neither Heath nor Siemens emphasizes it, but I have learned the hard way the need for routine maintenance of my drives. Cleaning and lubing those worm gears is particularly critical in order to get extended service. But improving ventilation over the drive in the H89 cabinet also is necessary, especially if your computer corner is not air conditioned. Enough said!■

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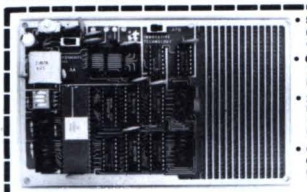

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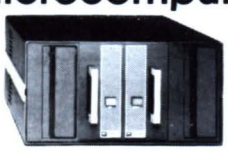

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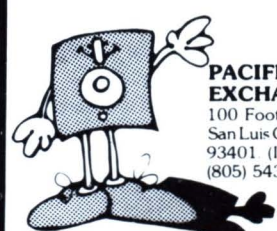

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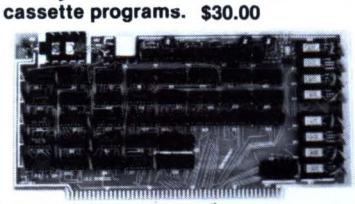

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By Alfred Fant

```
READY.      AUTHOR?
            TITLE ?
            SUBJECT? SCOUTING

HARD COPY ?

      author                    title                    subject
PROVINSE                DIARY OF A GIRL          SCOUTING
HAMILTON                THE FLAG TODAY           SCOUTING
CELY                    TROOP 15                 SCOUTING
```

Sample run 1. All books in the library are listed.

```
READY.      AUTHOR?
            TITLE ?
            SUBJECT? SCOUTING

HARD COPY ?

      author                    title                    subject
PROVINSE                DIARY OF A GIRL          SCOUTING
HAMILTON                THE FLAG TODAY           SCOUTING
CELY                    TROOP 15                 SCOUTING
GRAHAM                  TROOP ACCOUNT            SCOUTING
```

Sample run 3. The newly added book is listed.

```
READY.      AUTHOR?
            TITLE ?
            SUBJECT?

HARD COPY ?

      author                    title                    subject

GREEN                   AMATEUR RADIO            ELECTRONIC
PROVINSE                MY POINT OF VIEW         HISTORY
PROVINSE                DIARY OF A GIRL          SCOUTING
LEMENS                  THE FLAG                 ECONOMICS
HAMILTON                THE FLAG TODAY           SCOUTING
SMITH                   WEALTH OF NATIONS        ECONOMICS
CELY                    MY LIFE                  HISTORY
CELY                    TROOP 15                 SCOUTING
BROWN                   POEMS                    ENGLISH LIT
CATTUS                  CLASSIC PLAYS            ENGLISH LIT
```

Sample run 4. The complete, updated list of books.

Listing 1. Librarian program in IBM PC Basic.

```
10  REM (*************************************************************************)
20  REM (*        E & W / AUSTIN, TEXAS                                          *)
30  REM (*                                                                       *)
40  REM (*   PROGRAMMER:  ALFRED FANT, O.A.E.                                    *)
50  REM (*                                                                       *)
60  REM (*   PROGRAM:  LIBRARIAN                                                 *)
70  REM (*                                                                       *)
80  REM (*   ABSTRACT:                                                           *)
90  REM (*        THIS PROGRAM IS DESIGNED TO FUNCTION AS A STANDARD CARD        *)
100 REM (*      CATALOG SYSTEM FOR A HOME LIBRARY.  IT PROVIDES AN ORDERED       *)
110 REM (*      LIST OF BOOKS ACCORDING TO THEIR:  AUTHOR, TITLE, SUBJECT        *)
```

More

The best way to learn about a new computer file management system is to write a program using what you don't know. The subsequent debugging process will indelibly etch into your brain the proper way to read and write such files. The accompanying program listings can serve as a useful guide for your own efforts in this area.

The three versions of Basic available for the IBM Personal Computer are Cassette, Disk and Advanced Basic. The Cassette version resides in 40K of ROM, while the Disk and Advanced versions reside on the DOS system disk. The latter, which is the most extensive form of Basic, requires a disk-based machine of at least 48K bytes of RAM. My standard IBM PC has 64K, so until I double my available memory I won't be able to use IBM Pascal.

Basic is not Pascal, and this article will not compare these two high-level languages. But IBM disk file access is virtually the same for both languages.

The IBM PC uses two types of files: sequential (also known as "text files") and random (also known as relative record or binary files). The computer

Alfred Fant, Jr. (PO Box 26284, Austin TX 78755) is a computer consultant for Equanimity and Wherewithal.

```
MENU.       1 : NEW BOOK
            2 : SEARCHES
            3 : DELETE BOOK
            4 : NEW LIBRARY
            5 : STOP

CHOICE? 1
AUTHOR ? GRAHAM
TITLE  ? TROOP ACCOUNT
SUBJECT? SCOUTING
```

Sample run 2. Adding a book to the library.

reads sequentially accessed files more slowly than randomly accessed files, because of the latter's binary packed format. Sequential files are easier to program, but they use more memory space to store information. Random files are harder to program, but use less memory space.

The Librarian program shown in Listing 1 is based upon random files. The program is loosely structured after the System 2000 database management system, but differs in that it does not allow for any natural language processing. Still, you can locate a data record (book, magazine article, record album) by author, title or subject. I wrote the program in a Basic structured format suggestive of Pascal; it's menu driven.

Examples

Suppose you want to locate all books in your home library on the subject of Scouting. Once the program is loaded and running, you simply answer the questions like this:

AUTHOR?
TITLE?
SUBJECT? SCOUTING

The program will list all your books and articles dealing with Scouting. A Hard Copy option lets you specify output to the screen or to the printer. Note that a null response to the AUTHOR? and TITLE? questions dictated inclusion of *all* authors and titles about the subject of Scouting. This example is illustrated in Sample run 1.

Suppose you want to add a book to your home library. Just select CHOICE:1 from the menu and answer the questions. An example of adding a new book is illustrated in Sample run 2. Repeat the first example to show that the book has indeed been added to the library file (see Sample run 3).

If you want a listing of all the books in the library, answer all three questions (AUTHOR?, TITLE?, SUBJECT?) with null responses. Sample run 4 shows all the books in the sample ten-book library. The IBM-formatted 5¼-inch disk will hold a library of over 2500 books, since each book record is only 62 bytes long.

Six different combinations of searches can be made to access a particular data record. The Field statement in line 200 of the program sets the size of the record's subparts. You can, of course, alter these field widths to suit your own home library.■

Listing 1 continued.

```
120 REM (*                                                                *)
130 REM (*       THIS PROGRAM IS MENU DRIVEN AND IS WRITTEN IN IBM-PC BASIC *)
140 REM (*                                                                *)
150 REM (**************************************************************************)
160 REM
170 REM
180 REM program library
190 OPEN "B:SHELVES" AS 1 LEN=62
200 FIELD 1, 2 AS F$, 20 AS A$, 20 AS T$, 20 AS S$
210 CLS
220 PRINT "MENU.      1 : NEW BOOK"
230 PRINT "           2 : SEARCHES"
240 PRINT "           3 : DELETE BOOK"
250 PRINT "           4 : NEW LIBRARY"
260 PRINT "           5 : STOP"
270 PRINT
280 INPUT "CHOICE"; CHOICE
290 WHILE CHOICE<1 OR CHOICE>5
300   INPUT "CHOICE"; CHOICE
310 WEND
320 ON CHOICE GOSUB 350,510,1760,1970,2190
330 GOTO 190
340 REM
350 REM CHOICE=1 NEW BOOK SUBROUTINE
360 I=0 : LOOP=1
370 GET 1,1
380 S=CVI(F$)
390 WHILE LOOP=1
400   I=I+1
410   GET 1,I
420   IF A$=SPACE$(20) OR S=I THEN LOOP=0
430 WEND
440 IF S=I THEN PRINT "LIBRARY IS FULL" : RESET : RETURN
450 INPUT "AUTHOR "; AU$ : LSET A$=AU$
460 INPUT "TITLE  "; TI$ : LSET T$=TI$
470 INPUT "SUBJECT"; SU$ : LSET S$=SU$
480 PUT 1,I
490 RESET : RETURN
500 REM
510 REM CHOICE=2 SEARCHES SUBROUTINE
520    CLS
530    INPUT "READY.      AUTHOR"; AU$
540    INPUT "            TITLE "; TI$
550    INPUT "            SUBJECT"; SU$
560    PRINT ""
570    INPUT "HARD COPY "; P$ : IF P$="Y" THEN P=1 ELSE P=0
580    PRINT ""
590    IF P=1 THEN LPRINT TAB(7) "author" TAB(32) "title" TAB(55) "subject"
600    IF P=0 THEN  PRINT TAB(7) "author" TAB(32) "title" TAB(55) "subject"
610    IF AU$="" AND TI$="" AND SU$="" THEN MENU=1
620    IF AU$<>"" AND TI$="" AND SU$="" THEN MENU=2
630    IF AU$<>"" AND TI$<>"" AND SU$="" THEN MENU=3
640    IF AU$="" AND TI$<>"" AND SU$<>"" THEN MENU=4
650    IF AU$="" AND TI$="" AND SU$<>"" THEN MENU=5
660    IF AU$="" AND TI$<>"" AND SU$="" THEN MENU=6
670    Z$=SPACE$(20) : LSET Z$=AU$
680    Y$=SPACE$(20) : LSET Y$=TI$
690    X$=SPACE$(20) : LSET X$=SU$
700    ON MENU GOSUB 760,920,1080,1240,1410,1570
710    PRINT "" : PRINT "      Press any key to continue"
720    B$=INKEY$ : IF B$="" THEN 720
730    GOTO 190
740    REM
750    REM
760    REM MENU=1 SUBROUTINE
770       I=0
780       GET 1,1
790       B$=SPACE$(20)
800       S=CVI(F$)
810       WHILE S <> I
820         I=I+1
830         GET 1,I
840         IF A$<>B$ THEN B=1 ELSE B=0
850         IF P=1 AND B=1 THEN LPRINT A$;"    ";T$;"    ";S$
860         IF P=0 AND B=1 THEN  PRINT A$;"    ";T$;"    ";S$
870       WEND
880       CLOSE
890       RETURN
900   REM
910   REM
920   REM MENU=2 SUBROUTINE
930      I=0
940      GET 1,1
950      B$=SPACE$(20)
960      S=CVI(F$)
970      WHILE S <> I
980        I=I+1
990        GET 1,I
1000       IF A$<>B$ THEN B=1 ELSE B=0
1010       IF P=1 AND B=1 AND A$=Z$ THEN LPRINT A$;"    ";T$;"    ";S$
1020       IF P=0 AND B=1 AND A$=Z$ THEN  PRINT A$;"    ";T$;"    ";S$
1030     WEND
1040     CLOSE
1050    RETURN
1060  REM
1070  REM
1080  REM MENU=3 SUBROUTINE
1090     I=0
1100     GET 1,1
1110     B$=SPACE$(20)
1120     S=CVI(F$)
1130     WHILE S <> I
1140       I=I+1
1150       GET 1,I
1160       IF A$<>S$ THEN B=1
```

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Listing 1 continued.

```
1170      IF P=1 AND B=1 AND A$=Z$ AND T$=Y$ THEN LPRINT A$;"     ";T$;"     ";S$
1180     IF P=0 AND B=1 AND A$=Z$ AND T$=Y$ THEN  PRINT A$;"     ";T$;"     ";S$
1190      WEND
1200      CLOSE
1210      RETURN
1220   REM
1230   REM
1240   REM MENU=4 SUBROUTINE
1250      I=0
1260      GET 1,1
1270      B$=SPACE$(20)
1280      S=CVI(F$)
1290      WHILE S <> I
1300        I=I+1
1310        GET 1,I
1320        IF A$<>B$ THEN B=1 ELSE B=0
1330      IF P=1 AND B=1 AND T$=Y$ AND S$=X$ THEN LPRINT A$;"     ";T$;"     ";S$
1340     IF P=0 AND B=1 AND T$=Y$ AND S$=X$ THEN  PRINT A$;"     ";T$;"     ";S$
1350      WEND
1360      CLOSE
1370      RETURN
1380   REM
1390   REM
1400   REM
1410   REM MENU=5 SUBROUTINE
1420      I=0
1430      GET 1,1
1440      B$=SPACE$(20)
1450      S=CVI(F$)
1460      WHILE S <> I
1470        I=I+1
1480        GET 1,I
1490        IF A$<>B$ THEN B=1 ELSE B=0
1500        IF P=1 AND B=1 AND S$=X$ THEN LPRINT A$;"     ";T$;"     ";S$
1510        IF P=0 AND B=1 AND S$=X$ THEN  PRINT A$;"     ";T$;"     ";S$
1520      WEND
1530      CLOSE
1540      RETURN
1550   REM
1560   REM
1570   REM MENU=6 SUBROUTINE
1580      I=0
1590      GET 1,1
1600      B$=SPACE$(20)
1610      S=CVI(F$)
1620      WHILE S <> I
1630        I=I+1
1640        GET 1,I
1650        IF A$<>B$ THEN B=1 ELSE B=0
1660        IF P=1 AND B=1 AND T$=Y$ THEN LPRINT A$;"     ";T$;"     ";S$
1670        IF P=0 AND B=1 AND T$=Y$ THEN  PRINT A$;"     ";T$;"     ";S$
1680      WEND
1690      CLOSE
1700      RETURN
1710   REM
1720   REM
1730   REM
1740 REM
1750 REM
1760 REM CHOICE=3 : DELETE BOOK SUBROUTINE
1770     INPUT "ARE YOU SURE"; B$
1780     WHILE B$="YES" OR B$="Y" OR B$="y" OR B$="yes"
1790       INPUT "AUTHOR "; AU$ : LSET A$=AU$
1800       INPUT "TITLE  "; TI$ : LSET T$=TI$
1810       I=0 : II=0 : SP$=SPACE$(20)
1820       Y$=SPACE$(20) : LSET Y$=TI$
1830       Z$=SPACE$(20) : LSET Z$=AU$
1840       I=0 : II=0
1850       GET 1,1
1860       S=CVI(F$)
1870       WHILE S <> I
1880         I=I+1
1890         GET 1,I
1900         IF A$=Z$ AND T$=Y$ THEN PRINT "DELETE: ";A$; "     "; T$; "     ";S$
1910         IF A$=Z$ AND T$=Y$ THEN II=I : I=S
1920         IF II<>0 THEN LSET A$=SP$ : LSET T$=SP$ : LSET S$=SP$
1930       WEND
1940       PUT 1,II
1950       B$="N"
1960     WEND
1970       RESET
1980       PRINT "" : PRINT "      Press any key to continue"
1990       B$=INKEY$ : IF B$="" THEN 1990
2000       RETURN
2010 REM
2020 REM
2030 REM CHOICE=4 : NEW LIBRARY SUBROUTINE
2040     INPUT "ARE YOU SURE"; B$
2050     WHILE B$="YES" OR B$="Y" OR B$="y" OR B$="yes"
2060      INPUT "LIBRARY SIZE IN BOOKS"; SIZE
2070      LSET F$=MKI$(SIZE)
2080      PUT 1,1
2090      LSET A$=SPACE$(20)
2100      FOR I=2 TO SIZE
2110        PUT 1,I
2120      NEXT I
2130      B$="N"
2140    WEND
2150   CLOSE
2160    RETURN
2170 REM
2180 REM
2190 REM CHOICE=5 : STOP SUBROUTINE
2200     CLOSE
2210     END
```

AARDVARK — THE ADVENTURE PLACE

ADVENTURES FOR OSI, TRS-80, TRS-80 COLOR, SINCLAIR, PET, VIC-20

ADVENTURES — Adventures are a unique form of computer game. They let you spend 30 to 70 hours exploring and conquering a world you have never seen before. There is little or no luck in Adventuring. The rewards are for creative thinking, courage, and wise gambling — not fast reflexes.

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Except for Quest, itself unique among Adventure games, Adventures are non-graphic. Adventures are more like a novel than a comic book or arcade game. It is like reading a particular exciting book where you are the main character.

All of the Adventures in this ad are in Basic. They are full featured, fully plotted adventures that will take a minimum of thirty hours (in several sittings) to play.

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC.

TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

Editors note to players — In keeping with the large scale of Circle World, the author wrote a very large adventure. It has a lot of rooms and a lot of objects in them. It is a very convoluted, very complex adventure. One of our largest. Not available on OSI.

HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players—This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

NUCLEAR SUB by Bob Retelle — You start at the bottom of the ocean in a wrecked Nuclear Sub. There is literally no way to go but up. Save the ship, raise her, or get out of her before she blows or start WWIII.

Editors note to players—This was actually plotted by Rodger Olsen, Bob Retelle, and someone you don't know — Three of the nastiest minds in adventure writing. It is devious, wicked, and kills you often. The TRS-80 Color version has nice sound and special effects.

EARTHQUAKE by Bob Anderson and Rodger Olsen — A second kids adventure. You are trapped in a shopping center during an earthquake. There is a way out, but you need help. To save yourself, you have to be a hero and save others first.

Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

ADVENTURE WRITING/DEATHSHIP by Rodger Olsen — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of OSI, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

PRICE AND AVAILABILITY:

All adventures are $14.95 on tape except Earthquake and Haunted House which are $9.95. Disk versions are available on OSI and TRS-80 Color for $2.00 additional.

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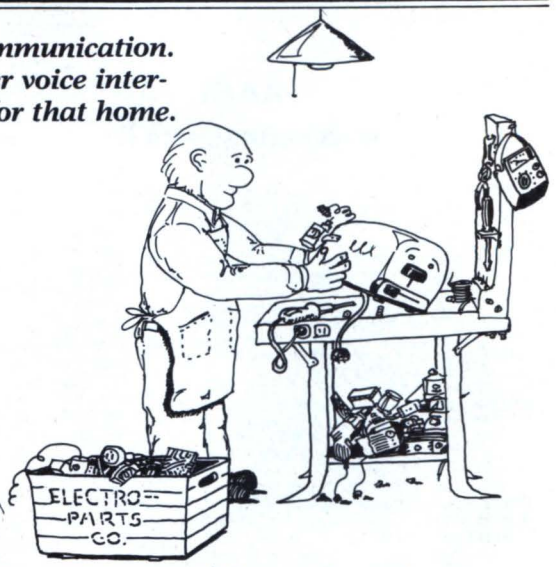
Circle 91 on Reader Service card.

The home of the future will rely heavily on voice communication. This month our author takes us beyond just another voice interface to an intelligent, useful conversational system for that home.



The Intelligent Toaster

By Mark J. Robillard

or

Experiments in Computer Control

I keep reading with enthusiasm about the micro with voice interface that will greet me at breakfast and tell me of the day's appointments. Of course, if I must first turn on the Apple, bring up the operating system, enable the voice driver and load the appointment program, I might just as well look on the calendar in the kitchen. Although these voice interfaces and programs can provide programmers with meaningful experience, they fall short of creating a useful conversational system.

I hope to show you a different direction in implementing voice interface circuitry. Yes, I will cover the available synthesis ICs and show how to use them, but I will emphasize voice input as the more important ability. I'll explore some circuitry involved here and provide for future direction in this area.

Last Month

Last month I wrote about bringing the future home control system into today, and I placed a great deal of importance on voice communication with all systems. This month I'll explore (but not exhaust) voice implementations. Later in the series I'll tie these first few articles together to form a small system—one that will grow into the complete home management unit.

Voice Output

We may want the system to speak to us because it is too costly to display such information or too inconvenient to read it. A hand-held computer with voice output would be a perfect application, because displaying more than eight or so characters becomes expensive and consumes more power. Let's look into three manufacturers' products with this in mind.

Texas Instruments' TMS 5200

This device is an outgrowth of the TI Speak 'n Spell toy. It is a specialized PMOS circuit that can be a bear to interface to today's microcircuitry. Yes it does boast 8-bit compatibility, but it seems to have been built with 4-bit microcomputers in mind. Yet with all these drawbacks it does produce intelligible speech, and you can buy a number of standard vocabulary ROMs. These vocabularies are completely contained on one chip, and chips can be added at will.

Notice I said "vocabularies." That means what we have here is a digital prerecorded tape player. Somebody actually spoke each word into a machine, had it digitized and compressed, and *voila*—speech synthesis (but not in my book).

I've included figures that show the interface circuitry required to hook the TMS 5200 family of parts to a micro. Both 8080/Z-80 type (Fig. 1a) and 6800/6500 style (Fig. 1b) connections are shown. Figs. 2 and 3 detail setup and speak-a-word routines from the standard vocabulary.

TI Applications

Where could you use a product like this? Well, it requires little power, but of course that extra interface circuitry presents a problem for small portable equipment. How about the security system, where a few prerecorded phrases will advise of intruders or help you set up the system? There are certainly enough words in the standard vocabulary (Table 1) for that.

National Semiconductor Digitalker

If you're a regular reader of *Microcomputing*, you should be well versed on this chip set (see "Advances in Speech Synthesis," p. 134, May 1981, and "A Super Synthesizer," p. 82, Aug. 1982, which detail operation and interfacing of the product).

The Digitalker is also a digital playback machine. The vocabularies available are smaller than TI's, but as time goes on more will be added. Unfortunately the design of the controller allows only one vocabulary set to be used at any one time; therefore, you will have to add extra circuitry to select between ROM sets. The vocabularies consist of two components each, so it is not a compact system.

You know which product I'm going to describe next. In fact, you've probably inferred that I lean toward using it. You're right!

Votrax SC-01A

Here is a real voice synthesizer. It comes to us in low-power-consuming CMOS wrapped in a small 22-pin package. There are no vocabulary ROMs, no bank switching, no other speech components. You see, this chip's vocabulary is the same as yours. Say anything you like with it—even four-letter words. Why do so many articles push the playback machines when this one chip will do?

Address correspondence to Mark J. Robillard, 3 Peach Lane, Townsend, MA 01469.

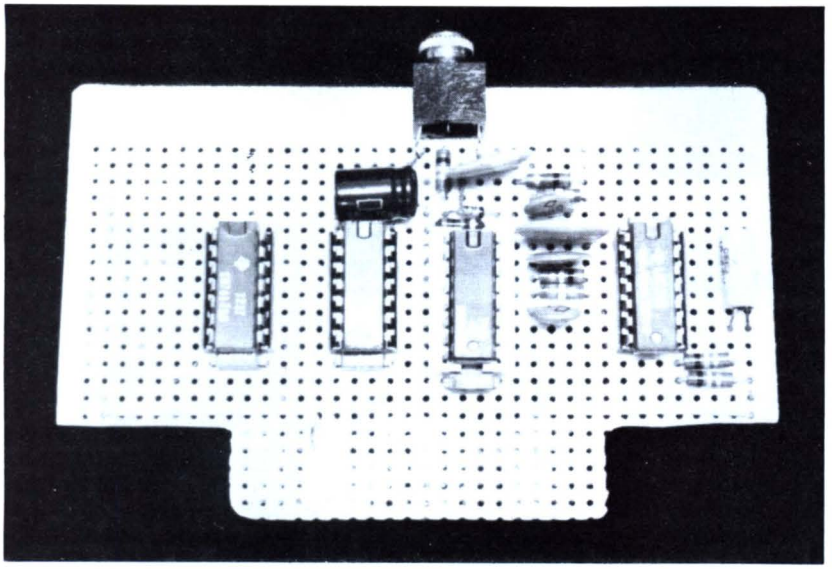


Photo 1. Votrax Speech Pac development board containing the SC-01A speech synthesizer. Along with allowing phoneme codes, the board has a 250-word preprogrammed vocabulary ROM accessible through the interface.

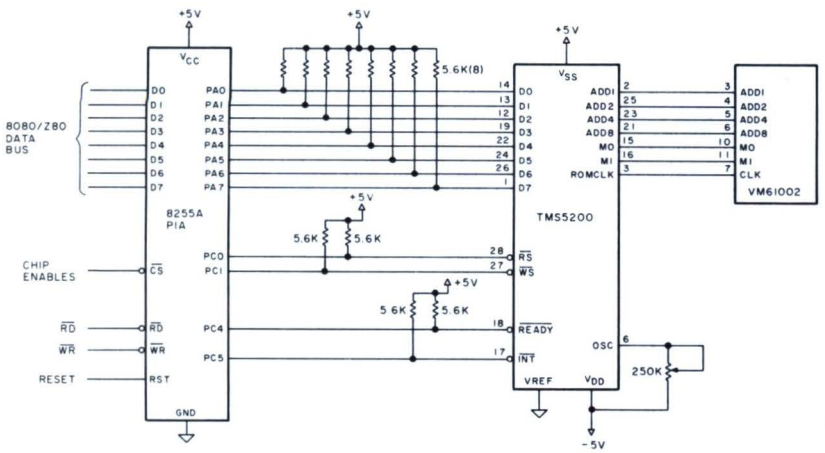


Fig. 1a. Circuit used to interface 8080/Z-80 processors to the TMS 5200 synthesizer.

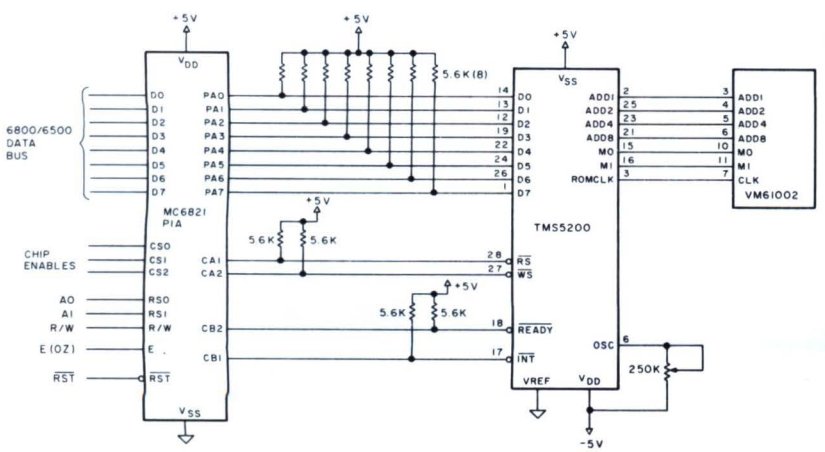


Fig. 1b. Circuit to interface 6800/6500 processors to the TMS 5200 synthesizer.

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FORTHWRITE: fast, powerful word processor w/easy keystrokes, Help screens, manual & demo files. Full proportional w/tabs, outdenting. Include other blocks, documents, keyboard inputs, & DATAHANDLER fields—ideal for form letters (requires MMSFORTH V2.0, 2 drives & 48K RAM) **$175.00***

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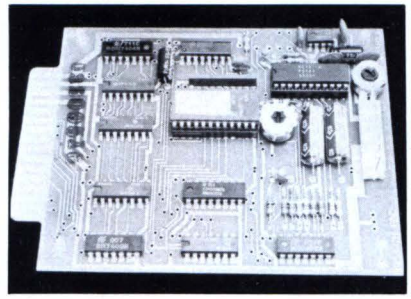

Photo 2. Experimental sentence recognizer board cut for use with the TRS-80 Color Computer.

Votrax has been producing unlimited voice output systems for a long time, although these generally came in a box with a multi-thousand-dollar price tag. Their first venture into the low-cost market was through Radio Shack with their TRS-80 Voice Synthesizer. Since then they have been developing a family of single-chip versions of their boards. The SC-01 was the first offspring.

An improved version, the SC-01A, replaced the older chip, and it started to see its way into products. Today numerous companies offer products that use the chip. Votrax markets the Speech Pac evaluation board (see Photo 1) and the Type 'n Talk ASCII text-to-speech peripheral.

I've heard two comments relating to the chip that are not true. The first is that it is more expensive than the Digitalker. Check again! You can get an SC-01A for $60. Try buying the National set (with both vocabularies, and even that isn't strictly comparable) for the same.

The other complaint I've heard is that you can't understand the words. This is only true when you don't know how to program it. You *can* get intelligible speech with a little practice.

Look at Fig. 4 and marvel at the lack of unnecessary interface circuitry. There are no setup procedures, so I don't need to show you flowcharts. Simply ship phoneme codes to it and listen to it talk. Did I slip something by you then? Well, almost. Phonemes are sound units, like the sound of the f in *first* or the *er* right after the f.

The SC-01A has a phoneme lookup table built into its circuitry—all you

WORD PHRASE	LOOK-UP TABLE	START ADDR	WORD PHRASE	LOOK-UP TABLE	START ADDR	WORD PHRASE	LOOK-UP TABLE	START ADDR	WORD PHRASE	LOOK-UP TABLE	START ADDR
ZERO	0002	019E	HENRY	006A	0F39	START	0084	1326	ABOUT	009E	1728
ONE	000C	02FF	INDIA	00B8	1AE7	STOP	00D2	1F41	GAGE	00EC	22FB
TWO	0016	047C	JULIET	0106	2737	TIMER	0120	2B82	GATE	013A	2F8B
THREE	0020	05BA	KILO	0152	3324	VALVE	016C	376E	GET	0186	3B86
FOUR	0004	01E8	LIMA 1	006C	0F89	LINE	0086	1371	GO	00A0	1788
FIVE	000E	0342	MIKE	00BA	1B3B	MACHINE	00D4	1F70	GREEN	00EE	234A
SIX	0018	04B3	NOVEMBER	0108	279D	UP	0122	2BFD	HIGH	013C	2FD4
SEVEN	0022	0606	OSCAR	0154	3373	DOWN	016E	37CC	HOLD	0188	3BC8
EIGHT	0006	0237	PAPA	006E	0FD2	OFF	0088	13C5	INCH	00A2	17AE
NINE	0010	0395	QUEBEC	00BC	1B7D	ON	00D6	1FCE	INSPECTOR	00F0	23B9
TEN	001A	04E5	ROMEO	010A	2814	IS	0124	2C28	INTRUDER	013E	300A
ELEVEN	0024	0650	SIERRA	0156	33C6	NUMBER	0170	3820	LEFT	018A	3C22
TWELVE	0008	026A	TANGO	0070	1014	TIME	008A	13F1	LOW	00A4	17F4
THIR-	0012	03ED	UNIFORM	00BE	1BC4	CONTROL	00D8	200A	MANUAL	00F2	242A
FIF-	001C	051B	VICTOR	010C	2874	ALERT	0126	2C5F	MEASURE	0140	307D
-TEEN	0026	06B8	WHISKEY	0158	341D	OUT	0172	3880	MILL	018C	3C61
TWENTY	000A	02B3	X-RAY	0072	106C	AUTOMATIC	008C	142E	MOTOR	00A6	1824
HUNDRED	0014	0425	YANKEE	00C0	1C42	ELECTRICIAN	00DA	2071	MOVE	00F4	24A1
THOUSAND	001E	0541	ZULU	010E	28CB	ADJUST	0128	2CBA	NORTH	0142	30CE
A	004E	0B75	AND	015A	3476	POINT	0174	3885	OF	018E	3C9C
B	0028	06EE	THE	0074	10D0	WAIT	008E	14AC	OPEN	00A8	1869
C	0036	0899	AMPS	00C2	1CA5	AT	00DC	20E2	OVER	00F6	24FC
D	0042	0A1E	HERTZ	0110	2914	BETWEEN	012A	2D1B	PASS	0144	3121
E	0050	0BA3	FARAD 1	015C	34CD	BREAK	0176	3904	PASSED	0190	3CC5
F	002A	0720	WATTS	0076	10F7	SMOKE	0090	14FB	PERCENT	00AA	18B2
G	0038	0BDB	MEGA	00C4	1CE0	RED	00DE	2111	PLUS	00F8	2547
H	0044	0A52	MICRO	0112	2948	MINUTES	012C	2D77	POSITION	0146	3172
I	0052	0BD9	MILLI	015E	351D	HOURS	0178	3948	PRESS	0192	3D11
J	002C	075A	METER	0078	1146	ABORT	0092	153C	PROBE	00AC	1904
K	003A	0919	PICO	00C6	1D2A	ALL	00E0	2160	PULL	00FA	2583
L	0046	0A8D	OHMS	0114	299C	BUTTON	012E	2DBD	PUSH	0148	31D1
M	0054	0C1B	CAUTION	0160	3556	CALIBRATE	017A	39AD	RANGE	0194	3D54
N	002E	079D	DANGER	007A	1191	CALL	0094	15A6	READY	00AE	194E
O	003C	095A	FIRE	00C8	1D80	CANCEL	00E2	2197	REPEAT	00FC	25BD
P	0048	0ACC	AREA	0116	29F0	CLOCK	0130	2E0B	RIGHT	014A	3201
Q	0056	0C5A	LIGHT	0162	35B1	CRANE	017C	3A21	SAFE	0196	3DB2
R	0030	07DD	PRESSURE	007C	11E4	CYCLE	0096	15E2	SET	00B0	198E
S	003E	0988	POWER	00CA	1DD3	DAYS	00E4	21DD	SHUT	00FE	2621
T	004A	0B02	CIRCUIT	0118	2A43	DEVICE	0132	2E49	SLOW	014C	324A
U	0058	0C8E	CHECK	0164	3601	DIRECTION	017E	3A75	SOUTH	0198	3DF2
V	0032	0809	CHANGE	007E	1228	DISPLAY	0098	1630	SPEED	00B2	19CC
W	0040	09B8	COMPLETE	00CC	1E21	DOOR	00E6	221F	TEST	0100	2658
X	004C	0B3C	CONNECT	011A	2A9E	EAST	0134	2E97	TOOL	014E	3292
Y	005A	0CCC	DEGREES	0166	3635	ENTER	0180	3AE3	TURN	019A	3E48
Z	0034	085D	MINUS	0080	1291	EQUAL	009A	1688	UNDER	00B4	1A16
ALPHA	005C	0D0E	REPAIR	00CE	1E8B	EXIT	00E8	226C	VOLTS	0102	2696
BRAVO	0062	0DE4	SECONDS	011C	2AEB	FAIL	0136	2ED8	WEST	0150	32D1
CHARLIE	0066	0EB0	SERVICE	0168	36CB	FEET	0182	3B17	YELLOW	019C	3E8B
DELTA	0060	0D91	NOT	0082	12E1	FAST	009C	16DD	OPERATOR	00B6	1A6A
ECHO	005E	0D4F	TEMPERATURE	00D0	IEEC	FLOW	00EA	22BA	GALLONS	0104	26D3
FOXTROT	0064	0E41	UNIT	011E	2B55	FREQUENCY	0138	2F1D			
GOLF	0068	0F01	SWITCH	016A	3721	FROM	0184	3B56			

Table 1. Standard TMS 5200 vocabulary contained in VM 61002 ROM.

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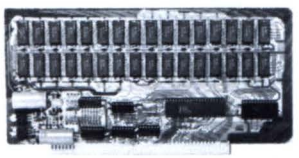

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Phoneme Code	Phoneme Symbol	Duration (ms)	Example Word
00	EH3	59	jacket
01	EH2	71	enlist
02	EH1	121	heavy
03	PA0	47	no sound
04	DT	47	butter
05	A2	71	made
06	A1	103	made
07	ZH	90	azure
08	AH2	71	honest
09	13	55	inhibit
0A	12	80	inhibit
0B	11	121	inhibit
0C	M	103	mat
0D	N	80	sun
0E	B	71	bag
0F	V	71	van
10	CH*	71	chip
11	SH	121	shop
12	Z	71	zoo
13	AW1	146	lawful
14	NG	121	thing
15	AH1	146	father
16	001	103	looking
17	00	185	book
18	L	103	land
19	K	80	trick
1A	J*	47	judge
1B	H	71	hello
1C	G	71	get
1D	F	103	fast
1E	D	55	paid
1F	S	90	pass
20	A	185	day
21	AY	65	day
22	Y1	80	yard
23	UH3	47	mission
24	AH	250	mop
25	P	103	past
26	O	185	cold
27	I	185	pin
28	U	185	move
29	Y	103	any
2A	T	71	tap
2B	R	90	red
2C	E	185	meet
2D	W	80	win
2E	AE	185	dad
2F	AE1	103	after
30	AW2	90	salty
31	UH2	71	about
32	UH1	103	uncle
33	UH	185	cup
34	02	80	for
35	01	121	aboard
36	IU	59	you
37	U1	90	you
38	THV	80	the
39	TH	71	thin
3A	ER	146	bird
3B	EH	185	get
3C	E1	121	be
3D	AW	250	call
3E	PA1	185	no sound
3F	STOP	47	no sound

**T must precede CH to produce CH sound.*
D must precede J to produce J sound.

Table 2. Phoneme codes and their ASCII equivalents used with the Votrax SC-01A speech synthesizer.

have to do is give it ASCII codes that represent these sound units. Table 2 lists the phoneme sounds and their ASCII equivalent codes. You can see that by sending the string "H38LOU" to the chip, it will greet you with a resounding "Hello."

Before we get wrapped up in implementations, let's explore the needs of an intelligent conversation system. What should it say, and when should it work?

Voice Output Systems Design

The kitchen information system would be a good one to start with. What responses are needed from this section?

- Good (morning, afternoon, evening). (Greeting when called up.)
- You have a (doctor, dentist, other) appointment. (Advising us of appointments.)
- The appointment is scheduled for (time). (Notification of time.)

The system would also recite other appointments of the day, and perhaps tomorrow's schedule, at this time. These responses would be the result of a specific request for this information.

Because of the open-ended nature of the vocabulary necessary for this system to work properly, it almost demands a phoneme-based vocabulary. My vote is to use a Votrax SC-01A in the kitchen.

Down the hall, at the security panel, the vital signs of the house are monitored and the intrusion/fire alarms are controlled. A fixed vocabulary system will work fine here—either the Digitalker or the TI5200 would fit in nicely. I have put together a few responses using the TMS5200 standard vocabulary ROM, that would probably be necessary in this system:

- Caution, intruder passed at range one.
- Enter temperature set valve.
- Enter time cycle of temperature.
- Danger, power service fail.

These simple phrases are somewhat awkwardly worded because I had to stay within the limits of the vocabulary. The Digitalker does not contain the word "temperature," so it's hard to use for thermostat setting. The SC-01A can respond in the following way:

- Caution, I have detected an intruder south of the house in zone 1.
- I suggest you telephone the police.
- Please enter the thermostat setting.
- Enter the time you wish this setting to be in effect.
- Danger, house power has failed.

Notice the natural flow of the information being presented! I must warn you though, that each of these chip sets possesses its own accent. The SC-01A sounds rather Swedish; the others are American, but, when combined, the words don't flow as you or I would say them.

Bedroom controllers require almost the same type of vocabulary as the kitchen system. There may be days you'd rather stay in bed—yet get the information anyway. With this in mind, I propose one voice synthesizer for the entire house. This unit would be resident in the UNIMEM controller that handles all substations like the kitchen, hall and bedroom units. Then, a few months from now, take the circuit in Fig. 4 and integrate it with others to make the command communicator section of UNIMEM complete.

Voice Input

You probably haven't seen many products that listen, nor have there been many practical voice recognition circuits presented in microcomputing magazines. Voice digitizer interfaces, where the analog signal from the microphone is sampled by an A/D converter, may give you 8000 samples per one second of speech. Perhaps you've read in the trade journals about recognizers with 40- or 100-word capability, and seen the multithousand-dollar price tags—I've been there too. Before you write off recognition as a viable alternative, examine your needs. Maybe the requisite accuracy and vocabulary are within your budget.

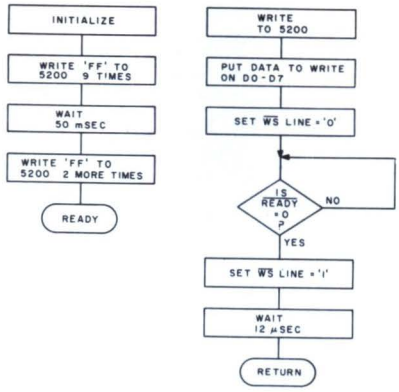

Fig. 2. Flowchart for setting up and writing to the TMS 5200.

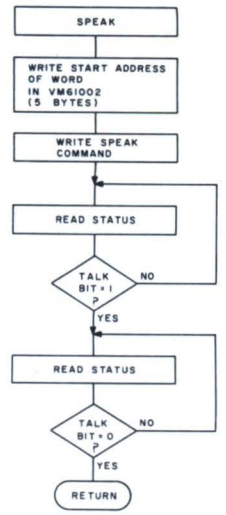

Fig. 3. Flowchart for reading status and commanding speech flow for the TMS 5200.

You'll want to be able to activate the computer by voice, and perhaps have it respond to "lights out" or "turn on lights." Of course you might not want the computer listening all the time.

Should you say sentences or just discrete words? Let's look at some key

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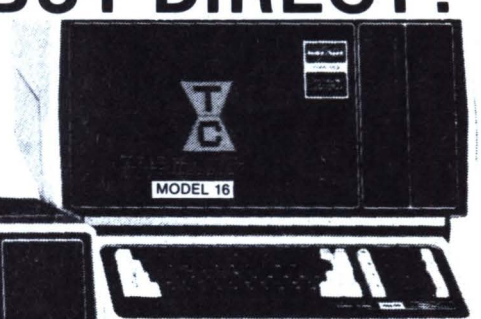

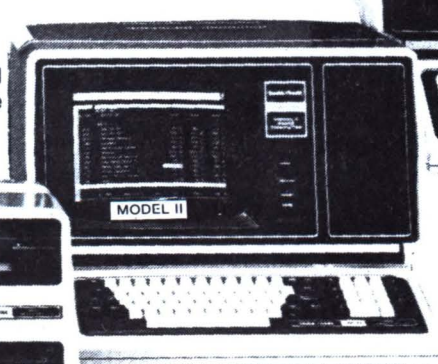

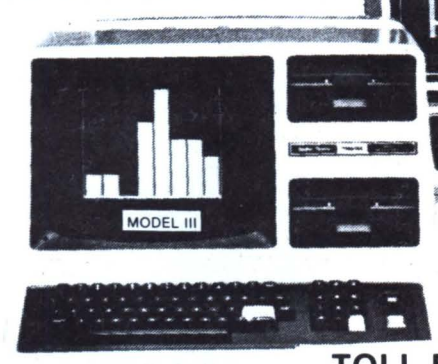

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parameters in voice recognition. The two types of recognizers are isolated-word and connected-word. The two methods of recognition are speaker-dependent and speaker-independent. The speaker-dependent isolated word combination is the most economical one. Here you must train the system to recognize your voice pattern while saying each expected command word.

Typically these machines require at least a 200 ms pause between commands to distinguish discrete words. Connected speech denotes sentences in which each word is recognized in rapid succession. These systems are fast and extremely expensive.

Speaker-independent systems will recognize a small number of words from many different speakers. These systems do not require training.

Interstate Electronics' VRC-08 is a

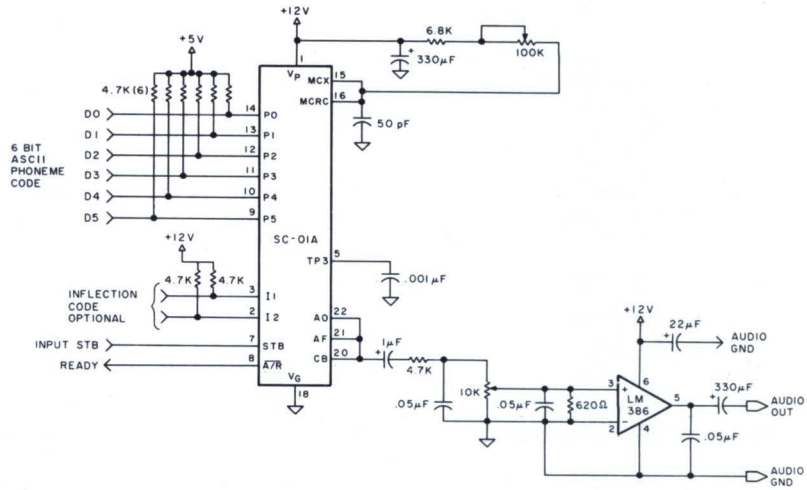

Fig. 4. Schematic diagram of a universal approach to interfacing the Votrax SC-01A phoneme speech synthesizer.

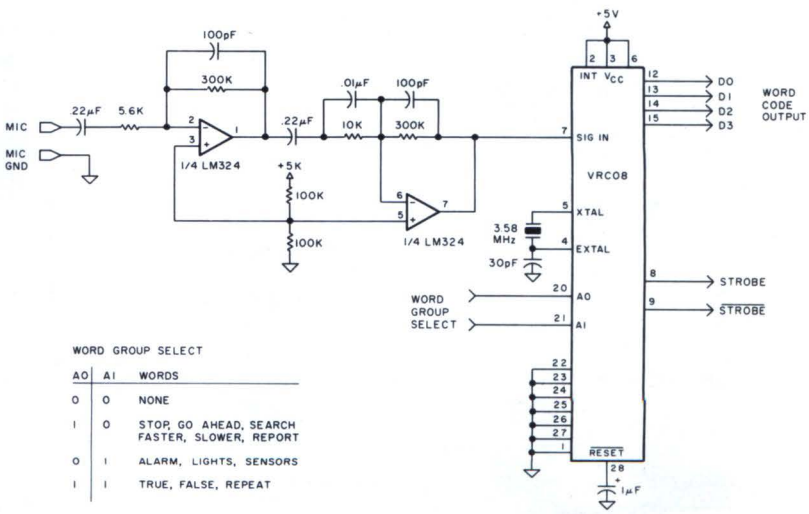

Fig. 5. Circuit diagram for use when connecting the Interstate Electronics VRC-08 voice recognizer chip.

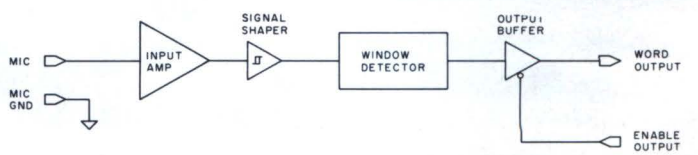

Fig. 6. Block diagram of experimental sentence recognizer.

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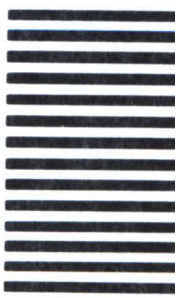

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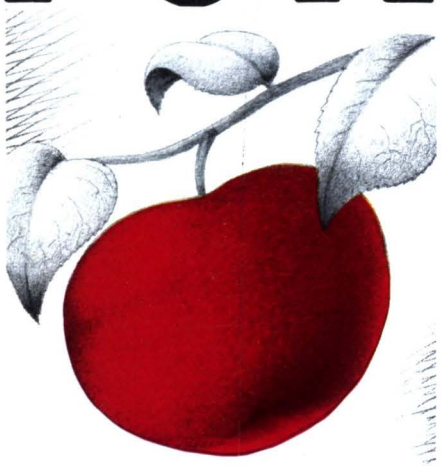

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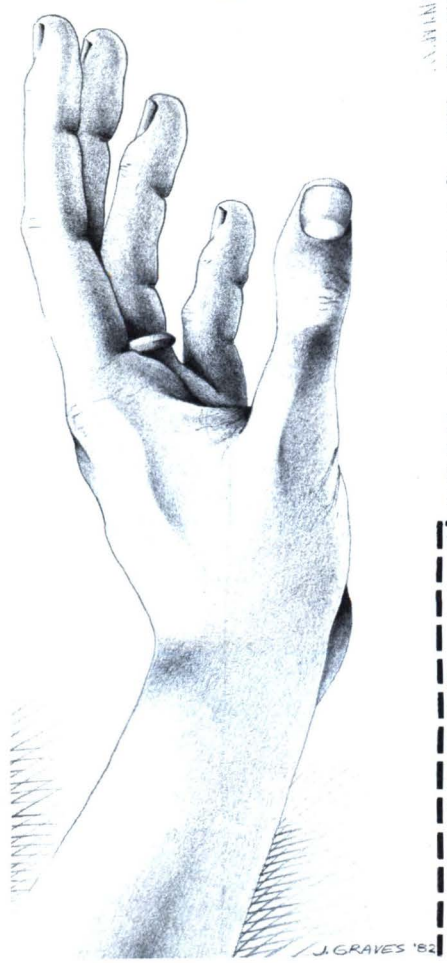

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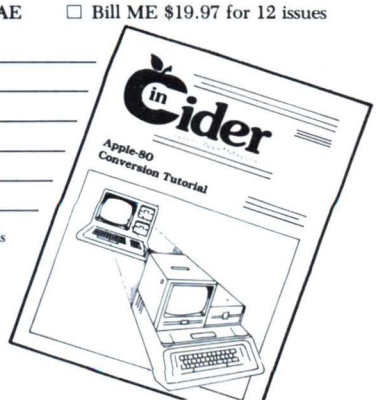

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Circle 272 on Reader Service card.

speaker-independent single chip recognizer pretrained to accept 12 words: stop, go ahead, search, faster, slower, report, alarm, lights, sensors, true, false and repeat. Although the VRC-08 is aimed at the high volume market, a single unit costs $175. Sure it's a bit steep, but remember how much 8080s used to cost.

Using this chip in conjunction with a voice system, you could enter a dialog such as this:

Computer: Good morning, what can I do for you?
You: Report, sensors.
Computer: All systems are normal.
You: Report, alarm.
Computer: There are no alarm conditions.
Computer: Do you want your appointments?
You: True.

This could be done with a hand-held computer. The circuitry necessary to interface the VRC-08 is shown in Fig. 5. All parts are readily available.

If you want to use a larger vocabulary, and complete sentences, some of my research might interest you. In sentence recognition I count words by detecting periods of silence. A silence of approximately one second indicates a finished phrase. Besides counting words, the system also measures the duration of each word. So two sentences of two words each, such as "Turn off" and "Run software," won't trigger as the same sentence because the length of the second word is different.

With this system I'm going to break with the theme of this article. Listing 1 is a Basic program designed to act as a voice development system for use with this sentence recognizer. It allows you to recognize up to 64 sentences. The actual implementation is for a TRS-80 Color Computer but any parallel port interface would do.

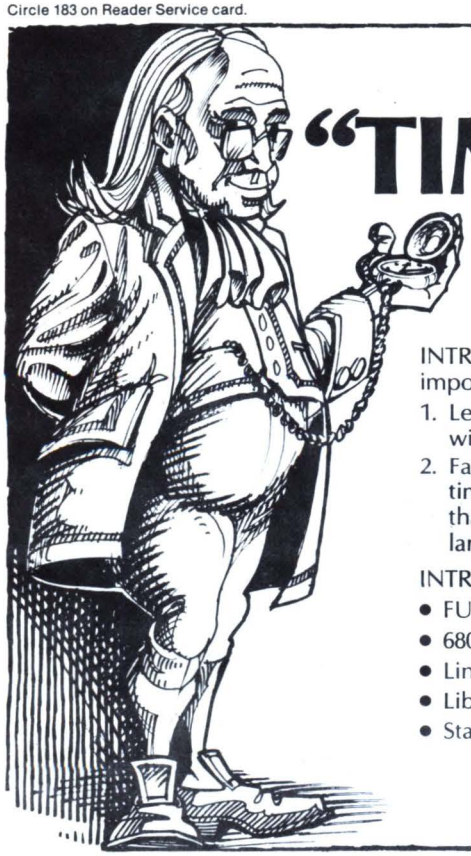
Photo 2 shows the completed recognizer built onto a perf board. You

Listing 1. Voicedit Basic development program for use with the experimental sentence recognizer.

```
1 '
2 '            VOICEDIT
3 '     VOICE RECOGNITION PROGRAM
4 '            VER 1.0
5 '
6 '
8 CLEAR 11000
10 RL=10:DIM F$(100):DIM VS(1200):DIM LS(10):DIM SC(100)
20 CLS:PRINT@6,"SENTENCE RECOGNIZER";
30 PRINT @ 42,"CHOOSE ONE";
40 PRINT @ 134,"1) CREATE OR EDIT FILE";
50 PRINT @ 166,"2) TRAIN VOCABULARY";
60 PRINT @ 198,"3) UPDATE VOCABULARY";
70 PRINT @ 230,"4) COMPARE PATTERNS";
80 PRINT @ 262,"5) RECOGNIZE MODE"
90 PRINT @ 294,"6) SET REJECT VALUE";
100 PRINT @ 326,"7) LIST VOCABULARY";
110 PRINT @ 358,"8) LOAD VOCABULARY";
120 PRINT @ 390,"9) STORE VOCABULARY";
140 A$=INKEY$:IF A$="" THEN GOTO 140
150 A=VAL(A$):ON A GOSUB 200,300,450,500,600,750,800,900,1000
160 GOTO 20
```

More

Circle 183 on Reader Service card.



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Listing 1 continued.

```
200 CLS:PRINT"CREATE OR EDIT ?";
205 A$=INKEY$:IF A$="" THEN GOTO 205
210 CLS:IF A$="E" THEN GOTO 240
215 FOR F=1 TO 100:F$(F)="":NEXT F
217 N=1
220 PRINT N;:INPUT A$:IF A$=CHR$(94) THEN RETURN
225 F$(N)=A$
230 N=N+1:IF N>100 THEN PRINT "NO MORE ROOM";:INPUT A:RETURN
235 GOTO 220
240 INPUT "ADD TO ...";A$:IF A$="Y" THEN GOTO 275
245 CLS:INPUT "ENTER SENTENCE NUMBER";A
250 CLS:PRINT@ 0,A;" ";F$(A);
252 F$(A)=""
255 PRINT@ 64,A;" ";
260 INPUT A$:F$(A)=A$
265 PRINT "MORE ...":INPUT A$:IF A$="N" THEN N=N+1: RETURN
270 GOTO 245
275 CLS
280 FOR F=1 TO N-1:PRINT F;" ";F$(F):NEXT F
285 GOTO 220
300 CLS:PRINT"ENTIRE VOCABULARY ?";
305 C$=INKEY$:IF C$="" THEN GOTO 305
310 CLS:IF C$="N" THEN GOTO 360
312 B=1
315 FOR X=1 TO 1000:VS(X)=0:NEXTX
317 T=1
320 FOR X=1 TO N-1:PRINT @ 224,X;" ";F$(X);
325 PRINT @ 398,"speak";T;
330 GOSUB 2000
335 FOR P=B TO B+8:VS(P)=VS(P)+LS(P-B):NEXTP
340 T=T+1:IF T<6 THEN GOTO 325
345 FORP=B TO B+8:VS(P)=FIX(VS(P)/5):NEXT P
350 VS(B+9)=WC:B=B+10:CLS:T=1:NEXT X
355 IF C$="N" THEN S=X:SK=0:GOTO 405 ELSE GOTO 400
360 INPUT "ENTER SENTENCE NUMBER";X:IF X=0 THEN RETURN
365 IF X=1 THEN B=1 ELSE B=(X*10)+1
370 T=1:FOR P=B TO B+9:VS(P)=0:NEXTP
375 CLS:PRINT @ 224,X;" ";F$(X);
380 PRINT @ 398,"speak";T;
385 GOSUB 2000
390 FOR P=B TO B+8:VS(P)=VS(P)+LS(P-B):NEXTP
392 T=T+1:IF T<6 THEN GOTO 380
395 FOR P=B TO B+8:VS(P)=FIX(VS(P)/6):NEXT P
398 VS(B+9)=WC:CLS:GOTO 355
400 S=1:B=1:SK=0
405 FOR P=B TO B+8
410 SK=SK+VS(P):NEXT P
415 SK=SK*VS(B+9)
420 SC(S)=SK
425 S=S+1:IF S>N-1 OR S>32 THEN GOTO 435
430 IF C$="N" THEN S=200: GOTO 435 ELSE B=B+10:SK=0:GOTO 405
435 IF S>N-1 THEN PRINT@224,"TRAINING COMPLETE";:INPUT A:RETURN
440 INPUT A:SK=0:GOTO 405
450 CLS:PRINT"ENTIRE VOCABULARY?";
455 A$=INKEY$:IF A$="" THEN GOTO 455
460 CLS:IF A$="N" THEN GOTO 470
465 B=1:GOTO 317
470 PRINT"ENTER SENTENCE NUMBER";
475 INPUT X:IF X=0 THEN RETURN
480 IF X=1 THEN B=1 ELSE B=(X*10)+1
485 T=1:GOTO 375
500 CLS:PRINT@230,"ENTER DELTA VALUE=";:INPUT DE:CLS
505 FOR S=1 TO N-1
510 FOR S1=1 TO N-1
515 IF S1=S THEN GOTO 535
520 IF SC(S)>SC(S1) THEN R=SC(S)-SC(S1):GOTO 530
525 R=SC(S1)-SC(S)
530 IF R<=DE THEN PRINT S;S1,
535 NEXT S1
540 NEXT S
545 INPUT A:RETURN
600 CLS:PRINT@32,"RECOGNITION MODE";
605 PRINT@106,"RESPONSE:";
610 PRINT@170,"1)  SENTENCE NUMBER";
615 PRINT@202,"2)  SENTENCE ASCII";
617 PRINT@234,"3)  NO RESPONSE";
620 A$=INKEY$:IF A$="" THEN GOTO 620
625 CLS:PRINT@106,"DISPLAY RESPONSE:";
630 PRINT@170,"1)  SENTENCE NUMBER";
635 PRINT@202,"2)  SENTENCE ASCII";
640 PRINT@234,"3)  NO DISPLAY";
645 B$=INKEY$:IF B$="" THEN GOTO 645
648 CLS
650 D$=INKEY$:IF D$<>"" THEN RETURN
```

More →

should use it to learn—it really doesn't work well in a practical system because the Basic program can only process voice. Later on you can interface the recognizer to several micros, using assembly-language programs that will give greater recognition accuracy.

The listing is self-explanatory in operation. The reject level is the difference in score between two similar sentences. If two utterances score less than that difference, both will be rejected. Try incorporating this circuit with just the Basic recognition routines into an application program.

I've just pointed out some applications of voice conversational systems rather than exact implementations. You should know what the circuit must do before you commit yourself to design.

Next Month

Voice recognition will not always provide the kind of input you need. Next month I'll explore touch input devices and systems. These circuits will let you select items from a changing menu on a CRT screen or control machine functions using variable format tactile panels.■

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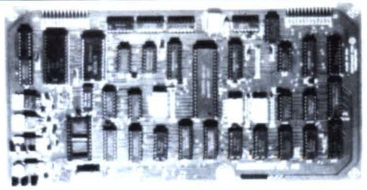

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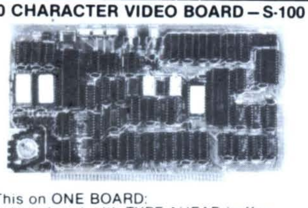

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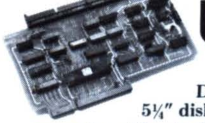

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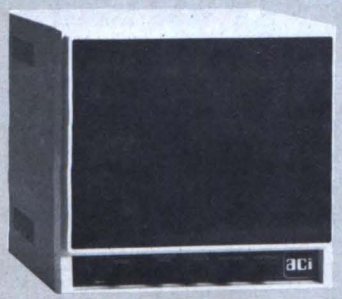

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Listing 1 continued.

```
652 PRINT@398,"speak";
655 GOSUB 2000
660 CLS:LC=0
665 FOR X=0 TO 8:LC=LC+LS(X):NEXT X
670 LC=LC*WC
675 IF SC(1)>LC THEN LN=SC(1)-LC:WS=1:GOTO 685
680 LN=LC-SC(1):WS=1
685 FOR S=2 TO N-1
690 IF SC(S)>LC THEN R=SC(S)-LC:GOTO 700
695 R=LC-SC(S)
700 IF LN>R THEN LN=R:WS=S
702 NEXT S
704 IF LN>RL THEN SOUND1,1:GOTO 650
705 IF B$="3" THEN GOTO 720
710 IF B$="2" THEN CLS: PRINT@32,F$(WS);:GOTO 720
715 CLS:PRINT@32,WS;
720 IF A$="2" THEN PRINT#-2,F$(WS)
725 IF A$="1" THEN PRINT#-2,WS
730 GOTO 650
750 CLS
755 PRINT@198,"PRESENT REJECT VALUE="RL;
760 PRINT@230,"ENTER NEW VALUE=";
765 INPUT D1:IF D1=0  THEN RETURN ELSE RL=D1:RETURN
800 CLS:PRINT@106,"1) TO DISPLAY";
805 PRINT@138,"2) TO PRINTER";
810 A$=INKEY$:IF A$="" THEN GOTO 810
815 CLS
817 FOR X=1 TO N-1
820 IF A$="2" THEN PRINT#-2,X;F$(X) ELSE PRINT X;F$(X)
825 NEXT X
830 INPUT A:RETURN
900 CLS:PRINT@170,"1) VOICE PATTERNS";
905 PRINT@202,"2) ASCII SENTENCES";
910 A$=INKEY$:IF A$="" THEN GOTO 910
915 CLS:INPUT"ENTER FILE NAME";T$
920 OPEN "I",#-1,T$
922 PRINT@234,"LOADING:";:PRINT@243,T$;
925 IF A$="1" THEN GOTO 955
930 FOR X=1 TO 100:F$(X)="":NEXT X
932 N=1
935 IF EOF(-1) THEN GOTO 950
940 INPUT #-1,F$(N)
945 N=N+1:GOTO 935
950 CLOSE #-1:CLS:INPUT A:RETURN
955 FOR X=1 TO 100:SC(X)=0:NEXT X
960 N=1
965 IF EOF(-1) THEN GOTO 980
970 INPUT #-1,SC(N)
975 N=N+1:GOTO 965
980 CLOSE #-1:CLS:INPUT A:RETURN
1000 CLS:PRINT@138,"1) VOICE PATTERNS";
1005 PRINT@170,"2) ASCII SENTENCES";
1010 A$=INKEY$:IF A$="" THEN GOTO 1010
1015 CLS:INPUT"ENTER FILE NAME";T$
1020 OPEN "O",#-1,T$
1023 CLS:PRINT@234,"STORING:";:PRINT@243,T$;
1025 IF A$="1" THEN GOTO 1045
1028 FOR P=1 TO N-1
1030 PRINT#-1,F$(P)
1035 NEXT P
1040 CLOSE#-1:CLS:INPUT A:RETURN
1045 FOR P=1 TO N-1
1050 PRINT#-1,SC(P)
1055 NEXT P
1060 CLOSE#-1:CLS:INPUT A:RETURN
1070 '
1080 '
1090 '
2000 ' WORD COUNTER SUBPROGRAM
2002 ' INPUT LOCATION 49152(CARTRIDGE) IS SAMPLED FOR ACTIVITY
2004 ' IF YOU WISH ANY OTHER PLACE CHANGE PEEK SOURCE
2006 '
2007 '
2009 WC=0:PC=0:GC=0
2010 FOR C=0 TO 9:LS(C)=0:NEXT C
2020 WV=PEEK(49152):IF WV<>127 THEN GOTO 2020
2030 LS(WC)=LS(WC)+1
2040 WV=PEEK(49152):IF WV=127 THEN GOTO 2030
2050 PC=PC+1:IF PC=2 THEN WC=WC+1:GOTO 2070
2060 GOTO 2040
2070 WV=PEEK(49152):GC=GC+1
2080 IF WV=127 THEN GC=0:PC=0:GOTO 2030
2090 IF GC=25 THEN RETURN
2095 GOTO 2070
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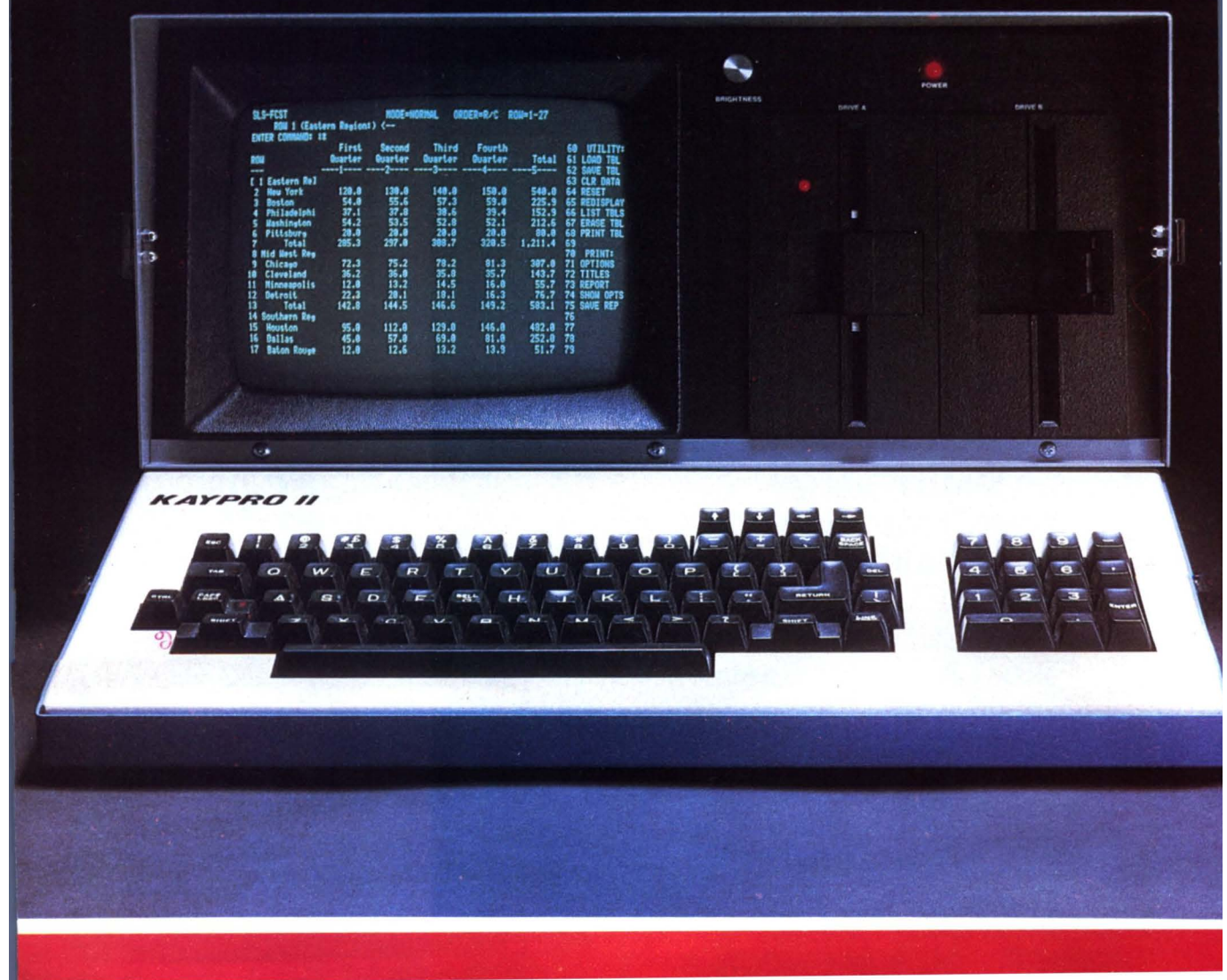
Kaypro II—The Perfect Traveling Companion

Although priced identically to the Osborne 1, the Kaypro II is a better bargain, according to this author.

By Carlene Char



The Kaypro II is a latecomer to the saturated market of personal computers, but you can't say it's missed the boat.

Non-Linear Systems (NLS) has taken direct aim at its competitors and hit the mark with its first computer. The Kaypro II, originally introduced as the Kaycomp II (see September 1982, *Microcomputing*), is top-dollar value, complete with video display, a pair of disk drives (at 200K each), an impeccable keyboard, parallel printer and serial interfaces, all handsomely housed in light steel.

Also included in the package is software that retails for as much as the entire package itself. Now that's a bargain, even if you do have a rich uncle.

Does all this sound familiar? With neither shame nor gall, Kaypro II is a marked improvement on the Osborne 1 prototype, while remaining as affordable and portable. Where the Osborne 1 has been innovative, the Kaypro II is now the one to be imitated.

Comparison

The prominent difference between the two portable computers is the nine-inch diagonal, high resolution, green phosphor Kaypro II video monitor with a full 80-character by 24-line display. Compared to the Osborne's five-inch black and white screen, which is limited by its notorious horizontal scrolling, the Kaypro II monitor excels.

The other notable difference is Kaypro's standard pair of double density, 5¼-inch floppy disk drives (200K each); Osborne's are single density (100K each).

The Osborne 1 package includes the following software: Wordstar, MailMerge, SuperCalc, Microsoft Basic and CP/M. Kaypro II comes with a comparable set of software: Select (which includes its own mailing list program), ProfitPlan, Structured Basic and CP/M. (In Novemeber 1982, however, Perfect Writer word processing software replaced Select.)

Both the Kaypro II and the Osborne 1 have 2K ROM and 64K RAM. Both units are run by a Z80A microprocessor and thus are compatible with CP/M software.

Not surprisingly, the systems are competitively priced at $1795. But the Kaypro II has other features that make it a better bargain.

The high quality of construction is quietly expressed by its casing of light steel. No flimsy plastic housing here.

A vinyl case is optional at $50, though there is hardly a need for one. The keyboard is delightfully responsive—the touch light and sure. The keys are sculptured and arranged in the IBM Selectric configuration.

The only change I'd make would be to switch the positions of the caps lock and control keys; I consistently hit the former instead of the latter. This results in HHHHLLLL being displayed across the screen when my intent is simply to move the cursor. Because the "ctrl" key is used so much in CP/M, I'm surprised this misplacement has gone unnoticed. Or do I have too short a little finger?

Another slight annoyance is the audible feedback (an "eck") when each key is depressed. This fortunately proved to be only a temporary nuisance—and then an absolute necessity.

On the plus side is a keyboard buffer that allows for speed typing without losing any text. A full 13-key pad with a return key is also included. The four cursor keys are a boon to fast editing.

The keyboard is fully detachable from the main housing, and its telephone-like coil cable attaches to the back of the computer, as do the other input/output connections. This keeps the screen and disk-drive area free of distracting cables, a bugaboo found on the Osborne 1. A Centronics-type parallel-printer port and RS-232 serial interface are included.

Take note that the Kaypro II is only compatible with parallel printers. There is one ac power plug and one power switch to contend with—definitely an overlooked, unappreciated convenience.

In its folded, upright position, the I/O ports, keyboard cable, power cord and fusebox sit on top with the carrying handle. All are exposed to the elements and rough handling.

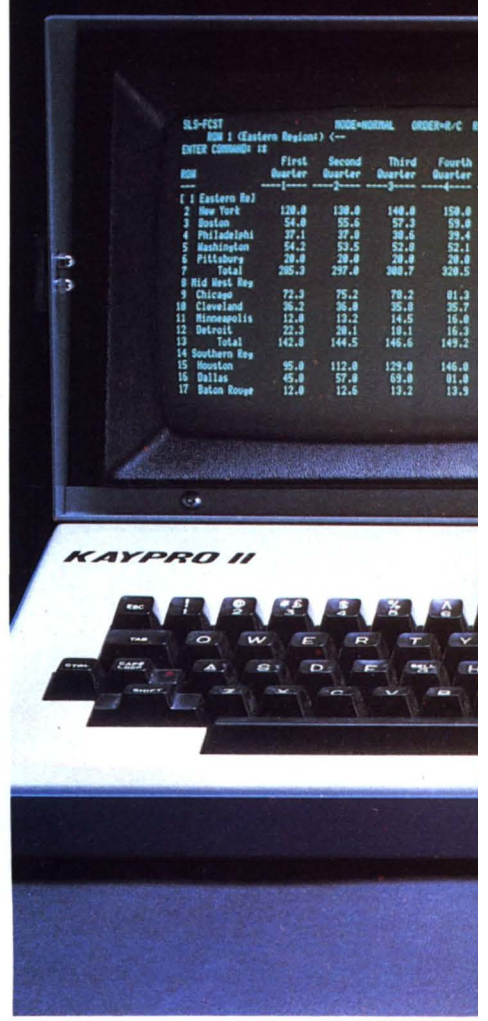
The disk drives are effectively cooled by convection; there is no annoying fan. Unlike the Osborne 1, overheating is not a problem.

The drives themselves are unobtrusive, turning off immediately when not being accessed, making the computer a quiet one to work with. Constantly spinning drives, like hammerjacks, should be shot.

The Kaypro II seems to have been rushed through production. This

Address correspondence to Carlene M. Char, 735 Ekekela Place, Honolulu, HI 96817.

At $1795, the Kaypro II from Non-Linear Systems (PO Box N, Delmar, CA 92014) is a bargain with word processing and financial spreadsheet packages.



would explain the poor packaging used to ship my delicate friend. My Kaypro was wrapped in a plastic bag, insulated by Styrofoam peanuts and braced by a cardboard box within another cardboard box—not the sort of packaging that inspires. A few good jolts and you have loose connectors; a hole in the bag and your disk drives start chomping on peanuts.

Software

The manual that comes with the Kaypro II seems more like a promotional pitch than an instructional guide; my manual was intended for "preliminary release for dealer use only." It's unfortunate that such a well-designed product should be so inadequately supported.

NLS must be depending on the computer, which is simplicity itself, to offset insufficient, sketchy instructions. But the beginner who doesn't even know how to close the disk-drive door

Within a matter of seconds, the Kaypro II transforms itself into a portable companion.

(believe me, I've been there) needs a meatier manual.

Specifically, a step-by-step guide to augment the accompanying CP/M and SBasic manuals would be an immense aid to the beginner.

In the SBasic manual, there is not the slightest hint that the CP/M context editor is used to write the Basic program. This omission seems as improbable as it is unpardonable.

Surely, a compiler like SBasic is neat and powerful stuff. But SBasic can't beat the simplicity of MicroSoft Basic. MBasic would have been the wiser choice for this computer. Kaypro users, I suspect, want to learn or improve their Basic and then write Basic programs for personal use. They would rather not bother with the intricacies of a compiler.

The other software programs, Select and ProfitPlan, are user-friendly, and include well-written manuals. Both programs have been well-adapted to this computer; I'm amazed at the speed of execution. I have run Select on other computers where you blink

Kaypro Goes to Washington

By Frank J. Derfler, Jr.

I was impressed with the cover article in the July 1982 *Microcomputing*; it described the use of an Osborne portable microcomputer by a journalist in Afghanistan. The microcomputer's presence among bearded and armed rebels gave the story an exotic flavor.

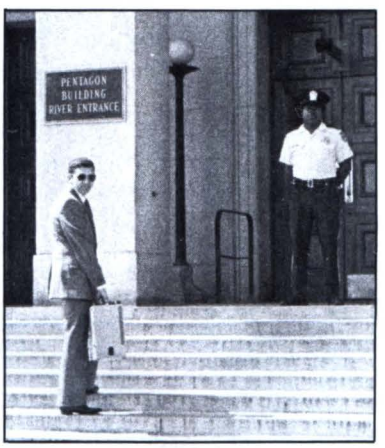
When an opportunity arose for me to review another portable microcomputer, the Kaypro II, I searched for some way to make the review as interesting as the Afghanistan story.

I work in the Pentagon every day, so I have the opportunity to observe a lot of strange characters. We don't have many bearded rebels or Russian soldiers, but we do have a lot of words and data to be processed, pushed and manipulated.

That's why a practicing bureaucrat in one of the largest corporations in the world, the US Department of Defense, can be found using a portable microcomputer—the Kaypro II.

The first thing the Kaypro computer taught me is that security guards are naturally suspicious of people carrying anything larger than a briefcase. The Kaypro's sturdy metal 26-pound cabinet is guaranteed to rouse the curiosity of building guards and airport security personnel.

I later found that US Customs Agents in particular have an interest in large, hollow-sounding metal cabinets. Building guards



The Kaypro II goes to the Pentagon in Washington, DC. Security guards and customs inspectors seem to have a built-in suspicion of large metal boxes. I had to show a building pass and proper identification before I could put the Kaypro II to work.

are usually satisfied with a close inspection of a building pass and airport guards may want to see your computer work, but the Customs Agent was so interested in what might be inside the cabinet that he pulled out his own screwdriver to find out. You may not have the same problems transporting a portable computer, but it *will* attract attention wherever you go.

Office Automation

I introduced the Kaypro to my office mates on a Monday morning. I was quick to put it to work to reduce criticism that it might be just an electronic toy. I brought in a Smith-Corona TP-1 printer with the Kaypro and set the two machines on a small credenza in my office.

I began typing the typical office notes and summaries I normally wrote in longhand. My previous attempts at preparing these notes on a manual typewriter were exercises in erasures, but I can do wonders with a word processor. And my co-workers enjoyed the novelty of being able to read what I wrote (my handwriting is that of a well-educated lefthander).

We have one secretary in the office who has shown interest in

(continued on page 70)

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faster than the cursor can move, so I'm happy to find with the Kaypro II a word-processing system that actually saves time.

Both Select and ProfitPlan are superlative examples of what computer software ought to be. In choosing these two programs, NLS has opted for simplicity over sophistication.

ProfitPlan can be upgraded to MicroPlan, a more powerful financial spreadsheet. Regrettably, the Select SuperSpell dictionary is not included. It becomes indispensable once you've tried it. It's painful to think that, for a few dollars more, the dictionary could have been included in the software package.

The Compleat Computer?

The Kaypro II is designed to be self-contained, so it's limited by not being readily expandable. But it's the near-perfect workhorse for business, professional or personal computing.

If you add on a dot-matrix printer (for example, Epson MX-80), you have an accounting/financial planning system for under $2500. More impressively, with a no-frills daisywheel printer (like the Smith-Corona TP-1) or interfaced electronic typewriter

(from page 68)

word processing systems, so when I went to a meeting, I invited her to try the Kaypro II. I set her up, went to my meeting and then went directly to lunch. When I came back, she was still sitting in front of the Kaypro II, but she was typing a business letter and waiting for me to show her how to use the printer so she could run off the other material she had saved on disk.

The Kaypro II and Smith-Corona TP-1 have a combined list price of $2700. Many offices have paid much more for much less capability.

Physical Attributes

The Kaypro II is a pleasure to use for long periods of time. The nine-inch screen is able to display 80 characters in 24 lines. The display tube uses a nice green on black phosphor, providing visibility in all kinds of lighting conditions.

The keyboard has a positive feel and can be positioned for comfortable typing. The keys are all in the right places and include a lighted caps lock, large shift and return keys and separate delete and backspace keys.

For those strange message systems and printers, a linefeed separate from the carriage return is included on the keyboard. And a ten-key adding machine pad makes inputting easy.

The Kaypro II keyboard and display are among the best I have seen on a microcomputer. I only wish I could plug the keyboard into my IBM PC!

Software Portability

Unique disk formats can limit the amount of commercial software available for the computer you use. The Kaypro II provides good software portability because it uses a standard version of the CP/M operating system, has a built-in RS-232C serial port and can read the single-density format used by the Xerox 820 computer. The disks created by the Kaypro II can each hold 191K of data, but to provide a readily available supply of software, they also read and use programs produced in the popular Xerox 820 format.

The Kaypro II has proven its worth as a traveling companion. I use it to keep notes at meetings, to write follow-up letters and to perform economic analyses away from home.

The total contribution of the Kaypro II toward my effectiveness or job performance is difficult to quantify. It is fair to say, though, that providing a bureaucrat or businessman with a desktop computer can generally increase effectiveness and may increase job satisfaction, even if the benefits aren't obvious.

For specific jobs, the Kaypro II has become the ideal office helper. It's a rugged and flexible system with many potential applications in government and business.

The Kaypro went to the Pentagon for a visit, but it stayed to work.■

Address correspondence to Frank Derfler, PO Box 691, Herndon, VA 22070.

(like the Bytewriter), you'd have a powerful word-processing system for under $3000.

Though its dimensions (18×14×8 inches) and weight (26 pounds) make it as cumbersome to carry as Grandma's gramophone, the Kaypro II does fold up conveniently. And an optional rechargeable battery pack is available.

The Kaypro II is practical, functional and economical. Its single-unit quality design is simple, yet elegant. I consider it the Honda of personal computers.

And as rare as the sensation is these days, be a bit proud that the Kaypro II is made (or at least assembled) in America.■

Unlocking Kaypro's Secrets

By Bob Hickey

What's it like to get into the Kaypro II after spending 16 months on a Superbrain?

Scary, that's what! Especially in my case. Prior to buying a Superbrain, I hadn't had any experience on any kind of computer. I knew little about computers then in comparison to what I know now.

I *did* know that Superbrain's 64K was better than what the machines I looked at in computer stores had. And the mail order prices of send-away-for machines, such as the Superbrain, are considerably less than the prices I was working with in computer stores.

So I ordered the Superbrain and in the 16 ensuing months, I used it several hours each day. In that time, I spent only $38 on repairs.

Then why switch to the Kaypro II?

First, I needed a portable computer to use between classes at the University of Alaska at Anchorage. I wanted a computer with 64K, two disk drives and a screen larger than the Osborne's. I also wanted double density and I wanted to be able to run my other CP/M programs on the computer.

Several Osborne competitors offered these features. But only the Kaypro II provided them in the price range of the Osborne. So I purchased the Kaypro II from a local computer store for $1771.

In the 16 months before that, I had acquired enough software to make my Superbrain user-friendly. I had purchased Magic Wand, CBasic-2, Supersort I, Information Engineering's IE/Prom and Superbrain diagnostic routines, Microproof's spelling checker, a CBasic accounting package, Micro Tax, the 1981 demo of Level II and SuperCalc. I assumed that these would be

(continued on page 72)

Kaypro II at a Glance

Uses

Personal computing, business, professional.

Manufacturer

Non-Linear Systems, PO Box N, Delmar, CA 92014 (714-755-1134).

Standard Features

Self-contained in a folding case; Z-80A eight-bit microprocessor; 2K ROM; 64K programmable RAM; integral nine-inch, green phosphor video monitor, full 80-character by 24-line display; brightness adjust knob; 76-key fully detachable keyboard with 13-key numeric pad; upper- and lowercase characters; keyboard buffer; two built-in 5¼-inch floppy disk drives, 200K bytes per disk; Centronics-type parallel printer and RS-232C interface ports; software included: CP/M operating system, Select, ProfitPlan, SBasic.

Base List Price

$1795.

Typical System Price

$2500 with dot-matrix printer; $3000 with letter-quality printer.

Documentation

User manual and individual software manuals.

Popular Options and Accessories

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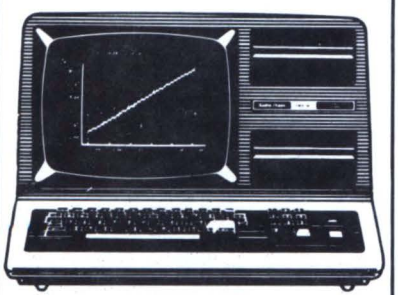

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(from page 71)

interchangeable with my Kaypro II.

Unfortunately, the Kaypro II isn't compatible with just any CP/M 5 ¼-inch disk. In fact, it's not even compatible with Cromemco, as indicated in the advertising. This was something I found out when I gave the people at Non-Linear Systems a call.

It turns out that the Kaypro II is able to read only Xerox 820 single-sided, single-density disks, along with Kaypro II-formatted ones.

> The Kaypro II isn't compatible with just any CP/M 5¼-inch disk.

I then got another rude shock—the rigidity of Select, the word processor provided free with the Kaypro II. After becoming accustomed to the freedom of Magic Wand, as well as its ability to provide indexes and to move blocks of text easily, Select was a letdown.

Select has a flaw for those who use Out Codes on their word processors to utilize the full capabilities of their MX-80s. Also, its merge option allows only 12 variables to be merged.

Select does have one feature that Magic Wand doesn't have—the ability to run .COM files from its command screen. This turned out to be an unexpected bonus and provided a way to take advantage of the capabilities of the MX-80.

Still, I had no way to get the programs over to my Kaypro II. Figuring I was stuck with SBasic instead of the CBasic-2 I was comfortable with, I decided to try a little program that would unlock some of the secrets of the Kaypro II.

The dealer I bought the computer from said there were no graphics in the Kaypro II, but the literature from a mail order outfit specified that there *were* some graphics, as well as Greek letters. I wrote a program in SBasic to make the screen scroll the ASCII characters with a conversion from decimal to hexadecimal.

My experience in computer language had been limited to CBasic-2. So when I opened the envelope containing the software manuals accompanying the Kaypro II, I thought I would find something similar to the CBasic-2. Not so! I found exhortations that "variables must be declared using the VAR statement," and "SBasic is a structured language built on a Basic syntax foundation."

It looked incredibly complicated compared to my CBasic-2. So I called the company that produced SBasic and explained to an employee that I couldn't automatically transport my CBasic-2 programs from my Superbrain to run under SBasic on the Kaypro II. He said that "variables must be declared" in order for me to run the XREF program provided with the CBasic-2 disk. I also asked how I could find the Greek letters and other graphics the Kaypro II literature promised. He gave me a program that didn't work, but which put me onto the correct path.

I finally came up with the program in Listing 1, which unlocked for me the secrets of the Kaypro II. Now I'm working comfortably in SBasic and I like it more with each program I write.■

Address correspondence to Bob Hickey, PO Box 222, Eagle River, AK 99577-0222.

```
var letter=char
var i=integer
begin
for letter = 0 to 222
print "DECIMAL CODE:
";ascii(letter);" = HEX CODE: ";
print HEX$(letter);" = ";letter
print
for i=1 to 1000
next i
next letter
if letter=222 then
end
```

Listing 1. Printout of the decimal value of the ASCII codes assigned in Kaypro II. It's useful in getting Kaypro II characters into Basic programs.

```
VAR A1=STRING
A1=CHR$(27)
  PRINT A1;"G"
END
```

Listing 2. Greek letterset turn-on program. Use Reset to get back to regular screen.

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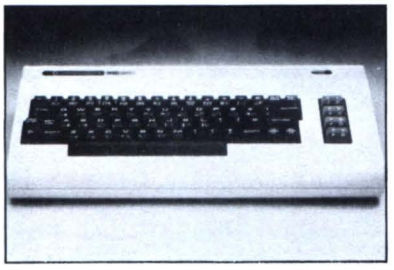
A Big Boost For First-Time Users

With the VIC-20, the emphasis is on "user-friendly." Beginning computerists can quickly and easily become involved in computing with the VIC's plug-in program cartridges and get acquainted with the machine's color, sound and graphics capability.

By Larry Dolce

The VIC-20, Commodore's first low-cost microcomputer introduced in late 1980, is still alive and kicking. In fact, the unit's future is very healthy: VIC-20 sales are accelerating, and the number of stores carrying the VIC-20 continues to increase.

The VIC, priced at under $300, includes such features as color, sound, memory expansion to 32,000 characters of storage, standard PET Basic, a full-sized typewriter keyboard, external expansion ports, a 22-character by 23-line screen display, programmable function keys and the Commodore graphics character set.



The "user-friendly" VIC-20 from Commodore.

The VIC is geared toward the home entertainment market, with games as its specialty. You can connect it to any television set or monitor. The manual devotes many pages to displaying graphics, and a chapter on animation is one of the book's best. It describes the use of peeks and pokes, and clearly explains how to incorporate animation into a program.

The computer can display eight border, eight cursor and 16 screen colors. Each screen location can be displayed in any color, and the graphics characters can be used to draw pictures in color. The VIC also has a voice, or, more correctly, four voices. A sound generator in the video interface chip lets the VIC send alto, tenor, soprano and noise voices through the TV speaker. To activate any voice, you poke a note value into one of the voices or speaker locations.

The manual includes a list of program subroutines that will produce sound effects useful for games, including "bombs away," "explosion" and "laser beam."

Because the VIC-20 comes complete with PET Basic, owners can run the large assortment of software written for the PET. The only apparent limitations on using these programs are memory and display size restrictions and the use of peeks and pokes.

The keys on the VIC have graphic symbols on both sides. The shift key controls the right side, while the Commodore logo key controls the left. Photo 1 shows the standard uppercase character set, Photo 2 the

Address correspondence to Larry Dolce, 2 Mayfield St., Valley Cottage, NY 10989.

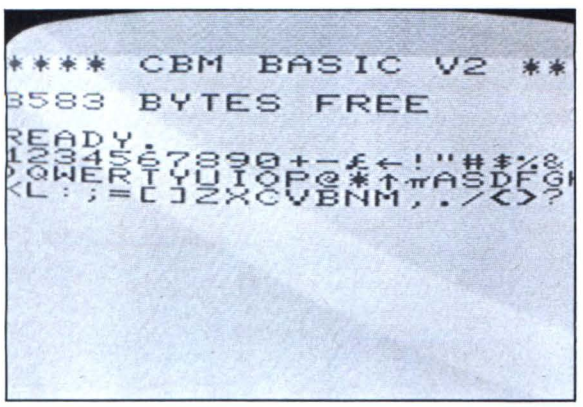


Photo 1. The VIC-20's standard uppercase character set.

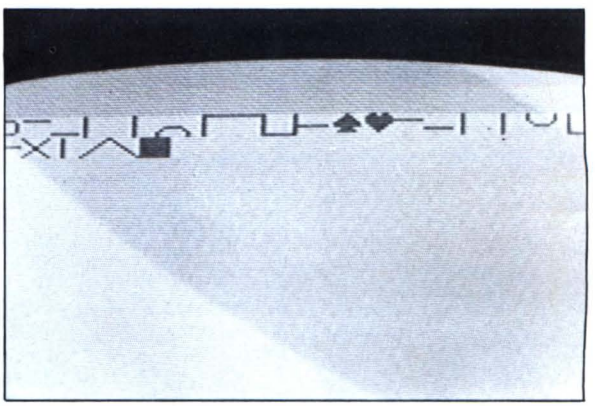


Photo 2. VIC-20 graphics controlled by the shift key.

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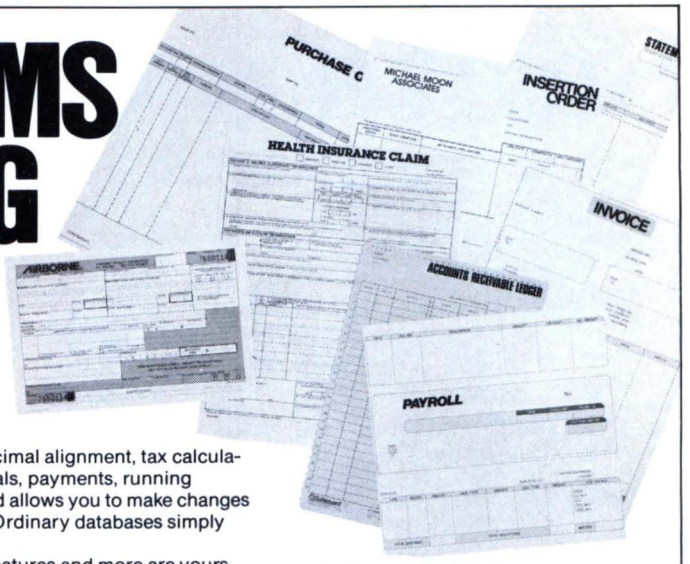

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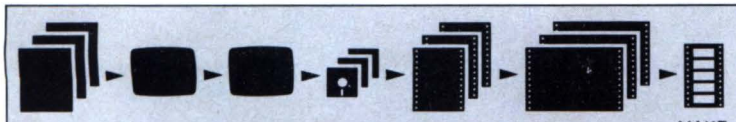

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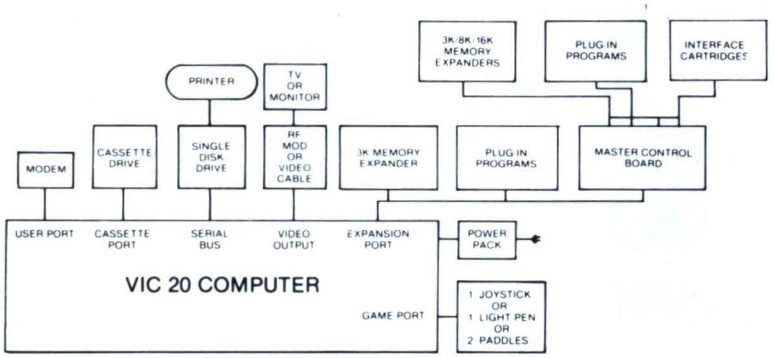

Fig. 1. Block diagram of VIC-20 (courtesy of Commodore International).

Arithmetic Operators

+, −, * (multiplication),/(division),↑(exponentiation)

Logical Operators

= Equals
< Less Than
> Greater Than
=< or <= Less Than or Equals
=> or >= Greater Than or Equals
<> or >< Not Equal

Logical Connectors

And, Or, Not

Commands

Cont, List, Load, New, Run, Save, Verify

Statements

Close, CLR, CMD, Data, DEF FN, DIM, END, For . . . To . . . Step, Get, Get#, GOSUB, GoTo or Go To, IF . . . Then, Input, Input#, Let, Next, On, Open, Poke, Print, Print#, Read, Rem, Restore, Return, Stop, Sys, Wait

Numeric Functions

ABS (X), ATN (X), COS (X), EXP (X), FNXX (X), INT (X), LOG (X), PEEK (X), RND (X), SGN (X), SIN (X), SQR (X), TAN (X), USR (X)

String Functions

ASC (X$), CHR$ (X), LEFT$ (X$,X), LEN (X$), MID$ (X$,S,X), RIGHT$ (X$,X), STR$ (X), VAL (X$), FRE (X), POS (X), SPC (X), TAB (X)

Table 1. VIC Basic features.

graphic symbols on the right and Photo 3 the graphic symbols on the left.

Hitting both the logo and shift keys causes the VIC to enter text mode. Here, only the left-side graphics are used. Text mode permits both upper and lowercase letters (see Photo 4).

VIC's 164-page manual adequately explains the color, sound and graphics features, but does not offer a tutorial in Basic programming. Commodore expects the VIC owner to buy the programmer's reference guide.

In all fairness to Commodore, the VIC guide does have a wealth of information, including instructions to display a character anywhere on the screen. It also has pin-out descriptions of all the I/O ports, plus program listings for games such as Tank vs UFO and Rocket Command.

The VIC comes with 5K of storage, of which only 3.5K are free for program use. But the VIC can be expanded up to 32K, in 3K, 8K or 16K increments. The 3K memory expansion module will plug directly into the back of the VIC. In addition to external plug-in memory, plug-in program cartridges are also available.

Available peripherals include a single disk drive, printer, modem, cassette drive, joystick and game paddles. The existing PET cassette drive can be used on the VIC, but the new cassette drive will be less expensive, and will include a tape counter. The cassette interface software is the same for the VIC and PET, so the VIC can load cassettes written on a PET.★

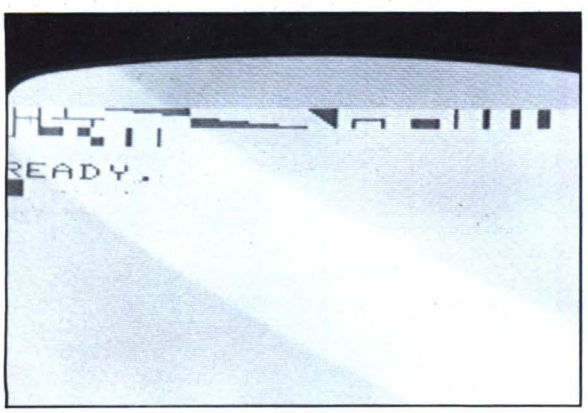

Photo 3. VIC-20 graphics controlled by the logo key.

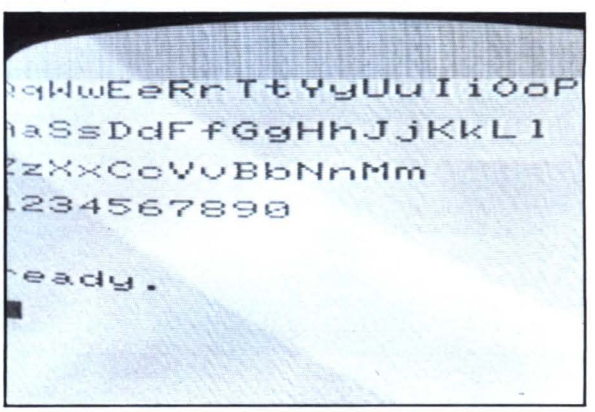

Photo 4. Text mode on the VIC-20 permits upper/lowercase.

Tests of Survival In Hostile Climates

Firebug

If you find arson
Intriguing, you'll
Love this game

Burn down a five story building! If this sounds exciting you may be interested in this improbable game. Points are scored depending on how much of each floor is burned. You lose only if you are caught in the flames.

This game is done with low-resolution graphics (no indication of this on the program jacket). Each floor of the building to be burned is arranged in a sort of maze. A timer to a "fuse" is set by the skill level. As you move about the floor of the building picking up cans of gasoline (amazingly left around by someone) and dispensing them on the walls, the fuse trails out behind—eventually it starts burning. You must leave the floor before it catches you, or you are engulfed in the flames.

The game is for the Apple II with 48K and disk drive and can be controlled by either the keyboard (keys are reassignable) or a joystick. I found the joystick harder to use because it is not used proportionally. Direction of travel is changed by detecting a threshold on the control. Movement on the screen is either up, down or sideways. No diagonal travel is allowed. If you score high enough, your initials can be recorded on the disk.

Sound effects attempt to imitate a fire and a ticking timer. The display is obviously done in color, but having only a black and white monitor I cannot comment on the effect.

This game boils down (pardon the pun) to finding the exit of five very simple mazes, and racing to them at the very last minute. It is possible to escape the building and "win" by not even attempting to start a fire and simply traveling directly to the exits of each floor.

I did not think the message "YOU MADE AN ASH OF YOURSELF" (presented whenever you are caught in the fire) particularly appropriate for a game obviously intended for younger players. Neither I nor my kid-game testers found Firebug a game worth playing more than once or twice at most. Your money could be better invested in another game. *(Muse Software, 347 North Charles St., Baltimore, MD 21202. $24.95.)*

Jim Hansen
New Boston, NH

B-1 Nuclear Bomber and Nukewar

Here are two war
Games that test
Your strategic ability

Imagine having your finger on "the button." Just think of the power you control; with just a press of the button you can unleash enough firepower to devastate an entire city and send all of its inhabitants to an early grave.

B-1 Nuclear Bomber is a text-only game. You start out as pilot of one of the USAF nuclear bombers flying a fail safe pattern over Thule AFB in Greenland. Suddenly there is a message telling you of an outbreak of hostilities. At this point I suggest you get a pencil and paper. You will be given a primary target and a list of secondary targets. You will also be given a cryptic code that you will need to know in order to arm the bomb you will use to destroy your primary target. Write the code and the primary target down. You will be busy on your way to the target and in all probability will forget the code.

You have many commands at your disposal and can get a list of them at any time during the game. Some of the commands are AL, altitude; CO, course; and AU, autopilot. These are the commands that you will use in the beginning to set the plane on the proper course. In order to find out what that course is, the game comes with a two-color map of the target area—which is the Soviet Union—and has an NA command, which will tie you into the navigator. Just tell him where you want to go and he will return the proper course setting for you to input.

Now if all that seems easy enough, the actual trip won't be. The enemy in defensing your attack will launch SAMs (surface to air missiles) and MIG-25 fighters, all of which are programmed to destroy you before you reach your target. To your B-1's credit you have some tricks of your own to use. EC is the command for electronic countermeasures. It is used to confuse the attacking unit's radar, causing them to lose their lock on you and miss. Don't use this command too often, because the more times you use it the more the enemy figures out what is happening. EV is the command for evasive action. This command is very useful in breaking the radar lock of the attacker. It violently alters both the course and altitude of your aircraft so be sure to check your status after its use so you know what direction you are heading. The aircraft will not resume its normal course after the use of this command; you must input it. In addition to being able to avoid your attackers by the means above, you can also fight back—after all isn't that why you wanted a war game? You have at your command five Phoenix missiles. The on-board combat computer will let you know when the attacking object is in range of the missile. You use the PH command to send it on its way. You will not have to plot the course for the missile; the computer does it for you.

If you are still in one piece after all that and make it to your primary target, the computer will let you know when you are in range to drop the bomb. In order to drop the bomb you must first arm it. This is where the code given you in the beginning comes in. You enter the code and the computer will respond with a final check to see if you really want to drop the bomb—sort of an electronic conscience. If you answer yes, the bomb is dropped. If you are still in range the target is completely destroyed. All you have to do then is set a return course for Thule AFB and go home. I guess I should mention that all of the enemy jets and missiles that you

did not destroy on the way will be waiting for you on the way back, so the flight is far from relaxing. When you arrive at Thule, you will be given a synopsis of the mission showing targets destroyed. If during the mission you were unfortunate enough to have your bomber get too close to a nuclear explosion, you will be told that you and your entire crew have died of radiation poisoning.

Nukewar

Nukewar is another war game in which you must plan strategy in order to emerge victorious. In this game you are given the opportunity to choose the countries that will do battle. You put in your country first and then the computer's. The computer will plot two eight-by-eight grids on the screen. These represent the two countries. Each dot of the grid represents a target. Letters are used to denote what type of target is at each grid location. The letter C stands for a city with a population of more than 100,000. The letters A, M, B, S stand for antiballistic missile site, missile base, bomber site and submarine base, respectively.

The computer will pick a random year for the game to start. This is the beginning of the cold war. You have several choices. You can build two bases of your own choosing; the strategy you plan will determine the type of bases you build.

There are certain times in the beginning of the game when your generals will not strike first, so you will have to pick another option. If you decide to build two new bases, the year of the cold war you are in plays an important role. You cannot build submarine bases before 1965 or ABM bases before 1970.

The longer the cold war goes on the greater the chance that the computer will declare war on you. You know this is happening when the words "cold war" in the upper right corner of the screen change to "nuclear war." If the computer starts the war it will be allowed the first volley unless you were fortunate enough to send a spy over on your last turn. In this case, you both have an equal chance during the beginning of the war. The computer will automatically activate some of your bases on the first turn, giving you at least a fighting chance.

If you activate your bomber base, you will be asked how many of the aircraft you wish to arm as fighters. The fighters will stay behind to defend your country against the computer's bombers. Those that you do not arm as fighters are assumed to be bombers and are sent off to the other country. It should be noted that once a bomber group is sent off it can only be destroyed by the opposing fighters. If the other country has only bombers then some of your bombers will get through.

This is the strategy that I have found to be most successful: Build as many bomber sites as possible and then arm them all as bombers. The computer rarely keeps enough fighters at home to fend off such an attack. Notice the word rarely; sometimes the computer does keep enough and wipes out all of the bombers and then proceeds to devastate your country.

You can also send any sub-bases that you may have out to sea. They carry a random amount of nuclear missiles to use. Both the submarines and fighters take time to reach the opposing country. This is to simulate flight and sea time to the target. While they are on their way you can use the missile bases that you have built to launch an attack on the opposing nation. Aim for the grids that have a base or city designation. The dots with no letters are only minor cities and don't count as much.

During the game the computer may tell you that the opposing Premier is on the "hotline" and ask if you want to negotiate a settlement. If you answer no, the war continues. If you answer yes, the war may end. Having successful negotiations depends on how many subs and bombers you have launched.

The game ends when all offensive weapons are exhausted. The computer figures out the winner by cities left, population left and who started the war.

These are only two of the many war games available for your computer. They are available on tape or disk for the Apple, Atari, Pet CBM, and TRS-80 Models I & III. The games are available on cassette for $16 and on disk for $21. *(Avalon Hill Game Company, 4517 Harford Road, Baltimore, MD 21214.)*

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Atari Runs Silent, Runs Deep

By William L. Colsher

There has been quite a bit of talk and excitement about Player/Missile graphics on the Atari computer systems. P/M graphics is the name given to the combination of special hardware and software that gives Atari computers the ability to run games like Star Raiders. Several very good articles have been published detailing the necessary peeks and pokes, but no one has actually published a whole game.

Listing 1. Wolf Pack using Atari player/missile graphics.

```
5 DIM SC$(10)
10 SCORE=0
20 H0=100:H1=80:H2=120:H3=100
30 TCNT=5:REM *** INITIAL NUMBER OF SHOTS
90 REM *** SET UP PLAYFIELD AND BLANK OUT ANY EXTRA GARBAGE THAT MIGHT APPEAR
100 GRAPHICS 8
110 SETCOLOR 2,0,0
115 SETCOLOR 1,0,0
120 POKE 559,62:REM *** SINGLE LINE P/M GRAPHICS
130 POKE 704,118:REM *** PLAYER 0 COLOR
140 POKE 705,56:REM *** PLAYER 1 COLOR
150 POKE 706,6:REM *** PLAYER 2 COLOR
155 POKE 707,62:REM *** PLAYER 3 COLOR
160 I=PEEK(106)-8:REM ***START OF P/M GRAPHICS AREA
170 POKE 54279,I:REM *** LET COMPUETR KNOW ABOUT IT
180 POKE 53277,3:REM *** P/M GRAPHICS ON
190 POKE 53256,3:REM *** PLAYER 0 QUAD SIZE
200 POKE 53257,1:REM *** PLAYER 1 DOUBLE SIZE
210 POKE 53258,0:REM *** PLAYER 2 REGULAR SIZE
215 POKE 53259,0:REM *** PLAYER 3 REGULAR SIZE
300 REM *** SET UP PLAYERS
310 J=I*256+1024:REM ***COMPUTE PLAYER 0 LOCATION
315 FOR Y=J+120 TO J+126:READ Z:POKE Y,Z:NEXT Y
320 RESTORE
330 J=I*256+1280:REM ***COMPUTE PLAYER 1 LOCATION
340 FOR Y=J+80 TO J+86:READ Z:POKE Y,Z:NEXT Y
350 RESTORE
360 J=I*256+1536:REM *** COMPUTE PLAYER 2 LOCATION
370 FOR Y=J+40 TO J+46:READ Z:POKE Y,Z:NEXT Y
380 J=I*256+1792:REM *** COMPUTE PLAYER 3 LOCATION
390 FOR Y=J+225 TO J+230:READ Z:POKE Y,Z:NEXT Y
400 REM *** DATA FOR PLAYERS
410 DATA 40,40,40,255,255,254,254
420 DATA 24,24,66,66,129,129
430 DATA 1,3,6,14,28,56,112
550 REM *** PUT PLAYERS AND MISSILE 3 ON THE SCREEN
560 MV=I*256+1000:MH=H3+3
570 POKE MV,192:POKE 53255,MH
600 POKE 53248,H0:POKE 53249,H1:POKE 53250,H2:POKE 53251,H3:POKE 53255,MH
605 REM *** FOLLOWING CODE MOVES THE SHIPS AROUND AND CHECKS FOR EDGE OF
606 REM *** SCREEN SITUATIONS
610 H0=H0+3:H1=H1+2:H2=H2+1
```

More

Wolf Pack is my attempt to present the P/M graphics techniques in a form that may be a little easier to understand and adapt than has previously been the case. The game itself is an adaptation of one of my favorite arcade games in which the object is to sink as many enemy ships as possible in the time allotted. In this version you get five shots at the passing ships with an additional two shots each time your score is a multiple of 50. You use the joystick to position your sub and the red button to fire a torpedo.

Rather than present a detailed discussion of already published information, I'll cover the main sections of the program and then discuss some of the compromises I had to make as a result of programming in Basic. I'll also present some possible solutions and places to go for additional information.

Nearly half of Wolf Pack is dedicated to setting things up. The only parts of this section of the program that might be slightly obscure are the For . . . Next loops that insert the player shapes into their slots. The variable J contains the location of the start of player 0's area. The offset of 120 determines the vertical position the player will appear at on the screen. Since we want the ships to appear at various places on the

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screen the offset number is different for each player.

Lines 600 through 710 handle most of the motion used in the program. Notice that in order to get the ships to move at different rates I simply add different numbers to their horizontal position variables (H0–H3) and then poke the new position into the appropriate register.

Lines 1100 through 1130 move the torpedo up the screen and watch for hits on other players. Line 1130 ignores a hit on your submarine. In the event of a hit on one of the ships, control jumps to line 2000, which erases the torpedo and makes an explosion sound. Lines 2010 and 2020 figure out which ship was hit and add the correct amount to your score.

Line 2025 checks to see if the score is a multiple of 50 and if it is adds two more torpedos to those remaining on your submarine. Lines 2030 through 2072 then figure out where in memory the image of the ship is and then sink it. Finally, the remaining program lines check for the end of game situation, and if you have indeed run out of torpedos your score is displayed and the program waits for you to press the Start key.

That's all there is to it. Player/Missile graphics are so powerful that even in Basic it is possible to write a program with five separate motions and have them all look smooth. Wait 'til you see what can be done in machine language. . . ★

Listing continued

```
620 IF H0>218 THEN H0=48
630 IF H1>218 THEN H1=48
640 IF H2>218 THEN H2=48
650 IF H3>200 THEN H3=200
655 IF H3<52 THEN H3=52
656 REM *** CHECK FOR HUMAN ACTION
657 IF STRIG(0)=0 THEN GOTO 1000
660 S=STICK(0):IF S=15 THEN GOTO 600
670 IF S=11 THEN H3=H3-2
680 IF S=7 THEN H3=H3+2
690 MH=H3+3
710 GOTO 600
1000 REM *** FIRE TORPEDO
1002 TCNT=TCNT-1:REM *** USE UP A TORPEDO
1005 POKE 53278,0:REM *** RESET COLLISION REGISTER
1009 REM *** KEEP SHIPS MOVING
1010 POKE 53248,H0:POKE 53249,H1:POKE 53250,H2
1020 H0=H0+3:H1=H1+2:H2=H2+1
1030 IF H0>218 THEN H0=48
1040 IF H1>218 THEN H1=48
1050 IF H2>218 THEN H2=48
1060 REM *** MOVE TORPEDO UP AND CHECK FOR A HIT
1100 POKE MV,0:MV=MV-3:POKE MV,192
1110 IF MV<I*256+770 THEN GOTO 3000
1120 IF PEEK(53259)=0 THEN GOTO 1005
1130 IF PEEK(53259)=8 THEN GOTO 1005
1140 GOTO 2000
1190 REM *** COME HERE IF WE HAVE A HIT
1195 REM *** FIRST MAKE AN EXPLOSION SOUND
2000 POKE MV,0:FOR T=16 TO 0 STEP -0.1:SOUND 0,50,8,T:NEXT T
2005 REM *** FIND OUT WHO WE HIT AND ADD TO SCORE AS APPROPRIATE
2010 HIT=PEEK(53259)
2020 SCORE=SCORE+10*HIT
2025 IF (SCORE/50)=INT(SCORE/50) THEN TCNT=TCNT+2:REM *** ADD 2 TORPEDOS IF SCOR
E MULTIPLE OF 50
2030 IF HIT=1 THEN PLAYER=0
2040 IF HIT=2 THEN PLAYER=1
2050 IF HIT=4 THEN PLAYER=2
2055 REM *** SINK THE SHIP
2060 PLOC=I*256+1144+(PLAYER*256)-(PLAYER*40)
2070 FOR Y=PLOC TO PLOC+6:READ D:POKE Y,D:NEXT Y
2072 FOR Y=PLOC+6 TO PLOC STEP -1:POKE Y,0:FOR R=1 TO 40:NEXT R:NEXT Y
2073 REM *** CHECK FOR END OF GAME
2075 IF TCNT<=0 THEN GOTO 3000
2080 POKE 53277,0:GRAPHICS 0:RESTORE :GOTO 100
3000 REM *** CHECK FOR LAST TORPEDO FIRED
3010 IF TCNT>0 THEN GOTO 550
3020 POKE 53277,0:GRAPHICS 2+16
3025 POSITION 4,1
3030 PRINT #6;"  NEW SCORE"
3040 SC$=STR$(SCORE):SL=LEN(SC$):POSITION (20-SL)/2,3:PRINT #6;SC$
3050 IF PEEK(53279)<>6 THEN GOTO 3050
3060 RESTORE :GOTO 20
```


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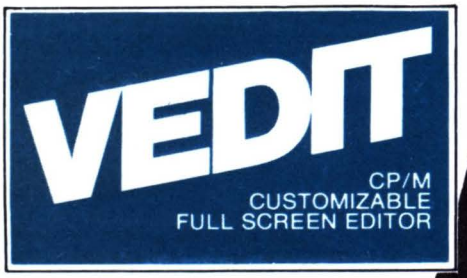

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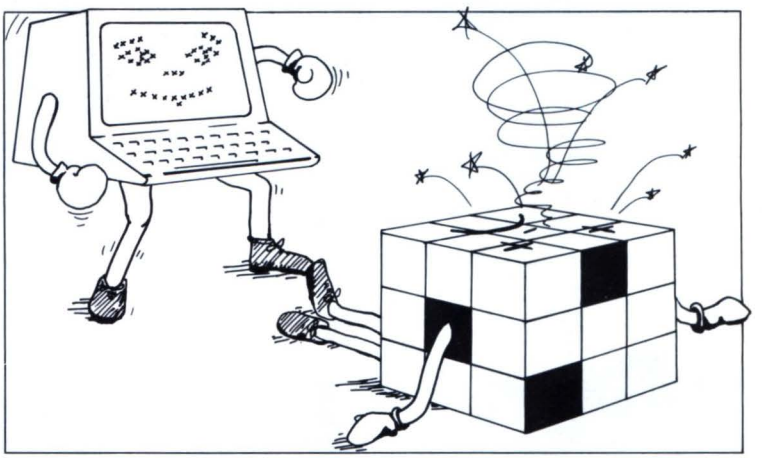
Conquering the Cube

By Fred Coffey

Don't let the Cube get the better of you. Fight back with this Atari simulation and solution program.



This program provides a joystick-controlled simulation and solution of a Rubik's Cube using an Atari computer equipped with a GTIA chip.

"What's a GTIA?" The original Atari computers were equipped with a color control chip called the CTIA, which allowed nine graphics modes. All new models are equipped with a replacement chip called a GTIA which allows three additional graphics modes. Graphics 9 provides 16 intensity levels of one color. Graphics 10 provides nine colors of varying intensities and Graphics 11 provides 16 colors of one intensity. Without the GTIA it is difficult to get enough colors on the screen for the Cube.

How can you tell which chip your computer has? One way is to type in line 8400 from the following listing and run it. If you see 15 colors on a black background, you've got a GTIA. But don't despair if you don't have a GTIA. Any Atari service center can modify your computer.

The instructions for the program are available as an option when you run the program. Therefore the rest of the comments in this article are for those who might want to tinker with the program.

First, not all Cubes have the same colors in the same initial arrangement. The data on line 130 in Listing 1 controls the colors and their initial arrangement. The first data value is the background grey; the next six numbers define the Cube colors. (If you're familiar with the Basic setcolor command, each of these numbers represents 16 times the hue value plus the luminosity value.)

The next most likely thing you may want to tinker with is the algorithm for solving the Cube. It has been claimed that any Cube can, theoretically, be solved in 17 moves (this has been termed "God's Algorithm"). However, as you will soon discover, this program isn't quite that good. It will normally take between 100 and 150 moves to complete the solution.

(Address correspondence to Fred Coffey, 4811 Orduna Drive, Coral Gables, FL 33146)

Listing 1. Electronic Cubist program for the Atari.

```
5 REM 'Electronic Cubist'
6 REM by Fred Coffey
7 REM
10 DIM C(7),F(54),H(54),A$(11),B$(2),BH$(2),M$(28),CHO$(36),TEST$(50),TARGET(3)
20 GRAPHICS 2:SETCOLOR 2,3,2:? #6;? #6;? #6;" ELECTRONIC CUBIST":? #6;? #6;? #6;"          by"
21 ? #6;"    fred coffey"
30 ? "DO YOU WANT INSTRUCTIONS?":? "  Using a joystick in port #1, push":? "  button for yes, move stick for no:"
40 IF STRIG(0)=0 THEN GOSUB 8000:GOTO 70
42 IF STICK(0)=15 THEN 40
70 CHO$="LDCDRDADLUCURUAUTRCRBRARF+TLCLBLALF-"
110 FOR J=1 TO 54:F(J)=1+INT(J/9.1):NEXT J
130 DATA 8,14,53,102,29,183,41,0
140 FOR J=0 TO 7:READ K:C(J)=K:NEXT J
999 REM INPUT NEW CUBE
1000 GRAPHICS 10:FOR J=0 TO 7:POKE 704+J,C(J):NEXT J
1005 COUNT=0
1010 FOR FACE=1 TO 54:X=23+(FACE-3*INT(FACE/3-0.1)-1)*5:Y=2+20*INT(FACE/3.0001)+4*INT(FACE/9.0001)
1015 SOUND 0,3*FACE,10,8
1020 IF FACE>27 THEN X=X-17:Y=Y-128
1030 IF FACE>36 THEN X=X+34:Y=Y-64
1040 IF FACE>45 THEN X=X+17:Y=Y-64
1045 COLOR 7
1050 PLOT X,Y:DRAWTO X,Y+16:PLOT X+1,Y:DRAWTO X+1,Y+16:PLOT X+2,Y:DRAWTO X+2,Y+16:PLOT X+3,Y:DRAWTO X+3,Y+16
1060 SOUND 0,0,0,0:NEXT FACE
1110 FOR FACE=1 TO 54:X=23+(FACE-3*INT(FACE/3-0.1)-1)*5:Y=2+20*INT(FACE/3.0001)+4*INT(FACE/9.0001)
1120 IF FACE>27 THEN X=X-17:Y=Y-128
1130 IF FACE>36 THEN X=X+34:Y=Y-64
1140 IF FACE>45 THEN X=X+17:Y=Y-64
1145 J=F(FACE)
1147 COLOR J
1150 PLOT X,Y:DRAWTO X,Y+16:PLOT X+1,Y:DRAWTO X+1,Y+16:PLOT X+2,Y:DRAWTO X+2,Y+16:PLOT X+3,Y:DRAWTO X+3,Y+16
1160 IF STRIG(0)=0 THEN F(FACE)=J:COUNT=COUNT+J:SOUND 0,40,12,15:FOR W=1 TO 30:NEXT W:SOUND 0,0,0,0:GOTO 1190
1170 IF STICK(0)=15 THEN 1160
1180 J=J+1:IF J>6 THEN J=1
1185 GOTO 1147
1190 NEXT FACE
1200 IF COUNT=189 THEN 1210
1202 GRAPHICS 18:? #6;? #6;? #6;"IMPROPER COLOR MIX--":? #6;"MUST HAVE 9 FACES OF EACH COLOR"
1204 FOR COUNT=1 TO 1000:NEXT COUNT:RUN
1210 REM INSTRUCTIONS HERE
1230 GOTO 5000
2499 REM STICK MOVED--CHANGE MOVE
2500 CHOICE=CHOICE+1
2505 SOUND 0,60,12,15:FOR W=1 TO 30:NEXT W:SOUND 0,0,0,0
 W:SOUND 0,0,0,0
2510 IF STKVAL()7 THEN 2600
2520 IF CHOICE<9 OR CHOICE>13 THEN CHOICE=9
```

More

The Cubists among you can probably do better. The solution algorithm is found in the 5000 series of line numbers; you're invited to change it. (Please send me a copy if you succeed in devising a significant improvement!)

Anyway, to revise the program you first need to understand how it keeps track of the Cube faces. The colors of each face are stored in the array F(1–54). The face colors are numbered one through six.

stored in the array F(1–54). The face colors are numbered one through six.

Whenever the program wants to move the cube in some way, it stores a series of two-letter instructions in the string M$; then it executes a GOSUB 6000. The subroutine returns only after executing all the moves and only if you signal approval for each move by pressing the button. (Note that if you change any of the moves with the joystick the program will have to start over at line 5000!)

The abbreviations in the string M$ define how the control face of the cube is to be moved. As an example, if M$ is set to LDTRF + AR, then the left side of the control face will be twisted down (LD), the top row turned to the right (TR), the face twisted clockwise (F +) and finally the whole thing turned to the right (AR). In other words, the first letter selects the part to be moved (Left, Center, All, etc.), while the second letter sets the direction (Right, Left, Up, etc.)

In general, then, the algorithm just consists of a lot of If statements to test for color matches followed by appropriate moves via M$ and GOSUB 6000.

At times, however, you simply want to know if one of the subcubes contains the two or three colors you're looking for, without requiring an exact alignment of each color face. To aid in this sort of test a subroutine (GOSUB 7000) was written. The use of this subroutine is illustrated by the statement at line 5050:

```
5050 TEST$ = "143205.301007.5089.
  LDBRLU":GOSUB 7000
```

The subroutine examines the above defined string TEST$ as follows: If faces 14,32 and 5 contain the same colors as faces 30,10 and 7 then POP (i.e. cancel the normal subroutine return) and go to line 5089 with M$ set for the move LDBRLU. If the colors are not the same then execute a normal Return and go on to the next statement.

You may be puzzled by all the data in the 9000 line numbers. It defines the 18 possible Cube moves. The first piece of data for each move is a string containing the two-letter abbreviation for the move (e.g. LU for left side up) followed by a nine-digit number. The nine digits define the turn signal flashing pattern shown on the TV screen to indicate the desired move. The rest of the data then defines

Listing continued.

```
2530 GOTO 2900
2600 IF STKVAL(>11 THEN 2700
2610 IF CHOICE(14 OR CHOICE)18 THEN CHOICE=14
2620 GOTO 2900
2700 IF STKVAL(>13 THEN 2800
2710 IF CHOICE)4 THEN CHOICE=1
2720 GOTO 2900
2800 IF CHOICE(5 OR CHOICE)8 THEN CHOICE=5
2900 B$=CHO$(2*CHOICE-1,2*CHOICE)
2910 GOTO 3020
2999 REM ROTATE PER INSTRUCTIONS
3000 PLRS=0:BH$=B$:CHOICE=0:POKE 77,0
3020 FOR J=1 TO 18:RESTORE 9000+10*J:READ A$:IF A$(1,2)=B$ THEN 3035
3030 NEXT J:? "INVALID COMMAND!":STOP
3035 FOR J=1 TO 9:K=VAL(A$(J+2,J+2)):X=19+5*(K-3*INT((K-1)/3)):Y=72+20*INT((K-1)/3)
3039 SOUND 0,18*(K+1),10,8
3040 COLOR 7:GOSUB 3060:IF STRIG(0)=0 THEN SOUND 0,40,12,15:FOR W=1 TO 30:NEXT W:SOUND 0,0,0,0:GOTO 3105
3041 SOUND 0,0,0,0
3045 COLOR F(K+9):GOSUB 3060:STKVAL=STICK(0):IF STKVAL=14 OR STKVAL=7 OR STKVAL=13 OR STKVAL=11 THEN 2500
3050 NEXT J:GOTO 3035
3060 IF K=0 THEN COLOR F(9)
3061 PLOT X,Y:DRAWTO X+1,Y:DRAWTO X+1,Y+2:DRAWTO X,Y+2:DRAWTO X,Y:RETURN
3105 COUNT=COUNT+1
3110 FOR J=1 TO 54:H(J)=F(J):NEXT J
3120 FOR J=1 TO 54
3125 SOUND 0,3*J,10,8
3130 READ K:IF K(100 THEN F(J)=H(K):PLRS=PLRS+K:GOTO 3200
3140 S=1:K=K-100:IF K)100 THEN K=K-100:S=-1
3150 FOR L=0 TO 8:F(J+L)=H(K+S*L):PLRS=PLRS+K+S*L:NEXT L:J=J+8
3200 NEXT J:SOUND 0,0,0,0
3205 IF PLRS()1485 THEN ? "BAD DATA FOR ";A$:STOP
3250 FOR FACE=1 TO 54:IF F(FACE)=H(FACE) THEN 3330
3260 X=23+(FACE-3*INT(FACE/3-0.1)-1)*5:Y=2+20*INT(FACE/3.0001)+48*INT(FACE/9.0001)
3270 IF FACE)27 THEN X=X-17:Y=Y-128
3280 IF FACE)36 THEN X=X+34:Y=Y-64
3290 IF FACE)45 THEN X=X+17:Y=Y-64
3300 J=F(FACE)
3310 COLOR J
3320 PLOT X,Y:DRAWTO X,Y+16:PLOT X+1,Y:DRAWTO X+1,Y+16:PLOT X+2,Y:DRAWTO X+2,Y+16:PLOT X+3,Y:DRAWTO X+3,Y+16
3330 NEXT FACE
3340 IF B$=BH$ THEN RETURN
3350 POP :POP
4999 REM START CUBE SOLUTION
5000 REM FIRST WE'LL WORK ON THE TOP.
5010 COUNT=0
5030 FOR SIDE=1 TO 4:IF SIDE)1 THEN M$="AL":GOSUB 6000
5031 REM DO TOP LEFT CORNER:
5040 IF F(30)=F(32) AND F(5)=F(7) AND F(10)=F(14) THEN 5099
5045 M$=""
5050 TEST$="143205.301007.5089.LDBRLU":GOSUB 7000
5060 TEST$="143205.120937.5089.RDBLRUBR":GOSUB 7000
5070 TEST$="143205.012848.5089.LUBLLDBL":GOSUB 7000
5080 TEST$="143205.033946.5089.RUBRRDBLBL":GOSUB 7000
5085 TEST$="143205.163619.5089.BR":GOSUB 7000
5086 TEST$="143205.342554.5089.BLBL":GOSUB 7000
5087 TEST$="143205.455227.5089.BL":GOSUB 7000
5089 IF M$()"" THEN GOSUB 6000
5090 IF F(18)=F(5) THEN M$="BLLDBRLU":GOTO 5098
5092 IF F(43)=F(5) THEN M$="LDBLLU":GOTO 5098
5094 M$="BLLDBLBLLUBLLDBRLU"
5098 GOSUB 6000
5099 NEXT SIDE
5100 REM NOW LET'S TRY THE TOP EDGES
5110 FOR SIDE=1 TO 4:IF SIDE)1 THEN M$="AL":GOSUB 6000
5120 IF F(5)=F(8) AND F(11)=F(10) THEN 5199
5125 M$=""
5130 TEST$="000510.000811.5166.CDBRCU":GOSUB 7000
5135 TEST$="000510.002904.5166.ARCDBRCUALBR":GOSUB 7000
5140 TEST$="000510.000247.5166.CUBLCD":GOSUB 7000
5150 TEST$="000510.000638.5166.ALCDBLCUARBR":GOSUB 7000
5152 TEST$="000510.001333.5166.CRCR":GOSUB 7000
5154 TEST$="000510.003151.5166.CL":GOSUB 7000
5156 TEST$="000510.001540.5166.CR":GOSUB 7000
5160 TEST$="000510.001720.5166.BR":GOSUB 7000
5162 TEST$="000510.003522.5166.BRBR":GOSUB 7000
5164 TEST$="000510.002653.5166.BL":GOSUB 7000
5166 IF M$()"" THEN GOSUB 6000
5168 TEST$="000510.004249.5170.BL":GOSUB 7000
5169 GOTO 5180
5170 M$="F-CLCLF+":IF F(42)=F(10) THEN M$="F+CLF-"
5175 GOTO 5198
5180 M$="BLCDBLBLCU":IF F(24)=F(10) THEN M$="CDBLCU"
5198 GOSUB 6000
5199 NEXT SIDE
5200 REM NOW TO SOLVE THE BOTTOM-FIRST WE HAVE TO ALIGN THE CORNERS:
5205 M$="AU"
5210 GOSUB 6000:SIDE=0:TEST$="103007.051432.5215.AU":GOSUB 7000:GOTO 5220
```

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Listing continued.

```
5215 SIDE=1
5220 TEST$="120937.051441.5225.AU":GOSUB 7000:GOTO 5230
5225 SIDE=SIDE+1
5230 TEST$="361619.143223.5235.AU":GOSUB 7000:GOTO 5240
5235 SIDE=SIDE+1
5240 TEST$="184321.144123.5242.AU":GOSUB 7000:GOTO 5245
5242 SIDE=SIDE+1
5245 IF SIDE<2 THEN M$="F+":GOTO 5210
5250 IF SIDE=4 THEN 5300
5260 TEST$="361619.321423.5261..":GOSUB 7000:GOTO 5262
5261 TEST$="091237.051441.5268..":GOSUB 7000
5262 TEST$="300710.320514.5263..":GOSUB 7000:GOTO 5264
5263 TEST$="184321.144123.5268..":GOSUB 7000
5264 GOTO 5270
5268 M$="TRF+TLLUTLLDTRF+F+":GOTO 5210
5270 TEST$="361619.321423.5272..":GOSUB 7000
5271 TEST$="184321.144123.5272..":GOSUB 7000:GOTO 5275
5272 M$="ADARAU":GOSUB 6000:GOTO 5270
5275 M$="TRF+TLLUTLLDTRF+F+":GOTO 5210
5300 REM CORNERS IN PLACE, NOW TO COLOR ALIGN:
5310 SIDE=0:IF F(10)=F(14) THEN SIDE=1
5315 IF F(12)=F(14) THEN SIDE=SIDE+1
5320 IF F(16)=F(14) THEN SIDE=SIDE+1
5325 IF F(18)=F(14) THEN SIDE=SIDE+1
5330 IF SIDE=4 THEN 5400
5335 IF SIDE=0 THEN 5360
5340 IF SIDE=1 THEN 5350
5345 IF F(12)=F(14) OR F(10)<>F(14) THEN M$="F+":GOSUB 6000:GOTO 5345
5348 GOTO 5360
5350 IF F(12)<>F(14) THEN M$="F+":GOSUB 6000:GOTO 5350
5360 M$="TRF+F+TLF+TRF+TL":GOSUB 6000:GOTO 5310
5400 REM NOW TO ORIENT CUBE TO FINISH BOTTOM:
5410 M$="AD":GOSUB 6000
5420 FOR SIDE=1 TO 4:IF SIDE>1 THEN M$="BL":GOSUB 6000
5422 IF F(17)=F(16) AND F(20)=F(19) THEN 5482
5425 TEST$="001619.001108.5426..":GOSUB 7000:GOTO 5430
5426 M$="F+CLF-":IF F(11)=F(16) THEN M$="F+CRF-F-CLF+"
5427 GOTO 5481
5430 M$="":TEST$="001619.003151.5442.CL":GOSUB 7000
5435 TEST$="001619.001333.5442.CRCR":GOSUB 7000
5440 TEST$="001619.001540.5442.CR":GOSUB 7000
5442 IF M$<>"" THEN GOSUB 6000
5445 TEST$="001619.004249.5450..":GOSUB 7000:GOTO 5460
5450 M$="F+CLCLF-":IF F(42)=F(16) THEN M$="F-CLF+"
5455 GOTO 5481
5460 TEST$="001619.001720.5465.F-CRF+":GOSUB 7000:GOTO 5470
5465 GOSUB 6000:GOTO 5450
5470 TEST$="001619.004424.5465.BLF-CRF+BR":GOSUB 7000
5475 TEST$="001619.005326.5465.BLBLF-CRF+BRBR":GOSUB 7000
5480 M$="BRF-CRF+BL":GOSUB 6000:GOTO 5450
5481 GOSUB 6000
5482 NEXT SIDE
5485 REM NOW FOR THE TOP AGAIN:
5487 IF F(10)=F(11) AND F(7)=F(8) THEN 5491
5488 TEST$="001007.001108.5490..":GOSUB 7000
5489 TEST$="001007.001540.5490..":GOSUB 7000:M$="CR":GOSUB 6000:GOTO 5489
5490 M$="F-CLF+CRF+CLF-":GOSUB 6000:GOTO 5487
5491 IF F(14)<>F(10) THEN M$="CR":GOSUB 6000:GOTO 5491
5492 IF F(14)<>F(16) THEN M$="BR":GOSUB 6000:GOTO 5492
5500 REM NOW WE WORK ON CENTER:
5505 IF F(14)<>F(11) THEN M$="CL":GOSUB 6000:GOTO 5505
5510 IF F(17)<>F(11) THEN M$="BL":GOSUB 6000:GOTO 5510
5515 M$="ADAL":GOSUB 6000
5520 SIDE=0:TEST$="001108.000514.5521..":GOSUB 7000:GOTO 5525
5521 SIDE=1
5525 TEST$="000247.000550.5526..":GOSUB 7000:GOTO 5530
5526 SIDE=SIDE+1
5530 TEST$="005326.005023.5531..":GOSUB 7000:GOTO 5535
5531 SIDE=SIDE+1
5535 TEST$="002017.002314.5536..":GOSUB 7000:GOTO 5540
5536 SIDE=SIDE+1
5540 IF SIDE=0 THEN M$="CUTRTRCDTRTR":GOSUB 6000:GOTO 5520
5545 IF SIDE<>1 THEN 5560
5550 TEST$="005326.002350.5552..":GOSUB 7000:M$="AU":GOSUB 6000:GOTO 5550
5552 TEST$="000247.000710.5555..":GOSUB 7000:M$="AUALAL":GOSUB 6000
5555 M$="CUTRTRCDTRTR":GOSUB 6000:GOTO 5520
5560 IF F(8)=F(5) AND F(17)=F(14) AND F(26)=F(23) AND F(2)=F(5) THEN 5599
5562 IF (F(2)=F(5) AND F(17)=F(14)) OR (F(5)=F(8) AND F(23)=F(26)) THEN 5570
5565 IF F(2)=F(5) OR F(8)=F(5) THEN M$="AU":GOSUB 6000:GOTO 5565
5570 M$="CUTRCUTRCUTRTRCDTRCDTRCDTRTR":GOSUB 6000:GOTO 5520
5599 GRAPHICS 2:? #6:? #6:? #6;"I'VE DONE IT!!":? #6:? #6;"IN ";COUNT;" MOVES!":STOP
5900 RETURN
5999 REM EXECUTE MOVES
6000 MOV=0
6010 MOV=MOV+1
6020 IF LEN(M$)<2*MOV THEN RETURN
```

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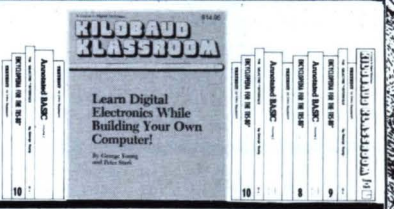

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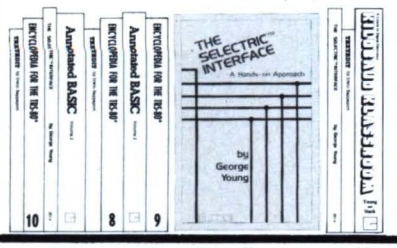

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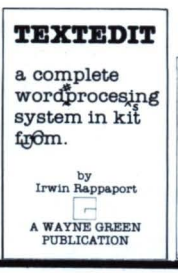

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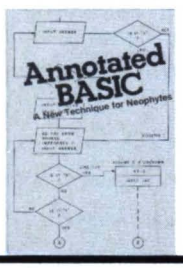

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the locations where each of the 54 Cube faces were before the move. (To save space, the data statements use 100 + n to indicate nine values in ascending order from n; use 200 + n for descending order.)

It looks like a lot of data with high potential for typing error. Take comfort, however, in the fact that the program does a check on the data (see line 3205) and will flag a bad entry.

The program, Electronic Cubist, uses Atari Basic and requires 24K of memory and an Atari 400/800 with a GTIA chip. ■

MICRO QUIZ

(from page 151)

Answer: 25

Statements 30 through 50 are skipped when I = −2, −1, 0, 1 and 2.

I = −5 => 0 <= J <= 25 => 13 vals
I = −4 => 1 <= J <= 16 => 8 vals
I = −3 => 2 <= J <= 9 => 4 vals
I = 3 => 8 <= J <= 9
I = 4 => 9 <= J <= 16
I = 5 => 10 <= J <= 25

The product I*J is positive only when I = 3, 4 or 5.

Listing continued.

```
6025 B$=M$(2*MOV-1,2*MOV)
6060 GOSUB 3000
6065 GOTO 6010
6999 REM PREPARE TO TEST A COLOR          COMBINATION
7000 FOR TF=1 TO 3:TARGET(TF)=F(VAL(TEST$(2*TF-1,2*TF))):NEXT TF
7010 FOR TF=1 TO 3:VF=F(VAL(TEST$(2*TF+6,2*TF+7)))
7020 IF VF()TARGET(1) AND VF()TARGET(2) AND VF()TARGET(3) THEN RETURN
7030 NEXT TF:POP :M$=TEST$(20):GOTO VAL(TEST$(15,18))
8000 GRAPHICS 0:? "In a moment I will put on the screen  in front of you a representation of   a 'Rubik's Cube'."
8010 ? :? "It will look as if the Cube had been  split at its seams and spread flat."
8020 ? "The face in the center represents the face closest to you."
8030 ? :? "The Cube will at first be black, and  your first task is to assign the"
8040 ? "colors.  I will 'suggest' a color for each face, and if you like it just"
8050 ? "push the button.  If you continue to  hold the button down I will complete  the Cube."
8060 ? :? "If you move the joystick I will":? "change the colors.  Just keep trying"
8070 ? "until you see the color you want, thenpress the button to lock in color.":GOSUB 8900
8080 ? "If you choose the colors for the cube,please take them from a real cube and"
8090 ? "don't just make them up.  I get very  confused if you give me an impossible"
8100 ? "color combination!":?
8110 ? "Once the cube is complete on the      screen we can start to work on it."
8120 ? "I will start flashing my 'directional turn signal' to indicate what I think"
8130 ? "we should do.  All moves are indicat- ed on the 'control face', which is"
8140 ? "the one closest to you.":?
8150 ? "If you want to accept my suggestion,  just press the button.  Give me enuf"
8160 ? "time and I'll solve the thing for you (you may want to follow along on your"
8170 ? "real cube).":GOSUB 8900
8180 ? "If you want me to solve it, however,  don't interfere!  Everytime you over-"
8190 ? "ride my move with one of your own I   have to start over!":?
8200 ? "You can control the movements of the  cube yourself, however, by moving the"
8210 ? "joystick.  Just decide which row or   column on the 'control face' you want"
8220 ? "to move and in what direction.  Then  just move the joystick in that"
8230 ? "direction.  I'll change my 'turn      signal' to match.":?
8240 ? "If I indicate the wrong column or row move, just move the stick again in"
8250 ? "the same direction.  I'll keep trying until I get it right!":GOSUB 8900
8260 ? "The fourth time you move the stick    I'll indicate a rotation of the whole"
8270 ? "cube.  The fifth time you move the    stick right or left I'll indicate a"
8280 ? "rotation of the face clockwise or     counter-clockwise.":?
8290 ? "Once you're satisfied, just push the  button and I'll make the move.":?
8300 ? "I'll keep making suggestions after    each of your moves--just ignore me"
8310 ? "until you're ready for me to take     over!":?
8320 ? :? "OK.  I'm ready when you are!":GOSUB 8900
8330 ? "Oh--one more thing--I can't work      unless you have an Atari with a 'GTIA'";
8340 ? "color chip.  As soon as you press the button next time I'll put a 'rainbow'"
8350 ? "on your screen before going on.  If   you don't see 15 colors, take your"
8360 ? "Atari back to your friendly dealer formodification!":GOSUB 8900
8400 GRAPHICS 11:FOR J=1 TO 15:COLOR J:FOR K=0 TO 4:PLOT J*5+K,0:DRAWTO J*5+K,190:NEXT K:NEXT J
8410 RETURN
8900 J=INT(RND(0)*16):SETCOLOR 2,J,2:SETCOLOR 4,J,2:? :? :? "PRESS BUTTON WHEN READY TO GO ON:";
8910 FOR J=10000 TO 0 STEP -3:SOUND 0,0,10,J:POKE 708,INT(RND(0)*222):IF STRIG(0)()0 THEN 8920
8915 SOUND 0,0,0,0:GRAPHICS 10:RETURN
8920 NEXT J:GOTO 8910
9010 DATA LU741000000,10,2,3,13,5,6,16,8,9, 19,11,12,22,14,15,25,17,18, 54,20,21,51,23,24,48,26,27
9011 DATA 30,33,36,29,32,35,28,31,34, 137, 46,47,7,49,50,4,52,53,1
9020 DATA LD147000000,54,2,3,51,5,6,48,8,9, 1,11,12,4,14,15,7,17,18, 10,20,21,13,23,24,16,26,27
9021 DATA 34,31,28,35,32,29,36,33,30, 137, 46,47,25,49,50,22,52,53,19
9030 DATA RU963000000,1,2,12,4,5,15,7,8,18, 10,11,21,13,14,24,16,17,27, 19,20,52,22,23,49,25,26,46
9031 DATA 128, 43,40,37,44,41,38,45,42,39, 9,47,48,6,50,51,3,53,54
9040 DATA RD369000000,1,2,52,4,5,49,7,8,46, 10,11,3,13,14,6,16,17,9, 19,20,12,22,23,15,25,26,18
9041 DATA 128, 39,42,45,38,41,44,37,40,43, 27,47,48,24,50,51,21,53,54
9050 DATA CU852000000,1,11,3,4,14,6,7,17,9, 10,20,12,13,23,15,16,26,18, 19,53,21,22,50,24,25,47,27
9051 DATA 128, 137, 46,8,48,49,5,51,52,2,54
9060 DATA CD258000000,1,53,3,4,50,6,7,47,9, 10,2,12,13,5,15,16,8,18, 19,11,21,22,14,24,25,17,27
9061 DATA 128, 137, 46,26,48,49,23,51,52,20,54
9070 DATA CL654000000,101, 10,11,12,40,41,42,16,17,18, 119
9071 DATA 28,29,30,13,14,15,34,35,36, 37,38,39,49,50,51,43,44,45, 46,47,48,31,32,33,52,53,54
9080 DATA CR456000000,101, 10,11,12,31,32,33,16,17,18, 119
9081 DATA 28,29,30,49,50,51,34,35,36, 37,38,39,13,14,15,43,44,45, 46,47,48,40,41,42,52,53,54
9090 DATA AU740850960,110,119,254
9091 DATA 30,33,36,29,32,35,28,31,34, 43,40,37,44,41,38,45,42,39, 209
9100 DATA AD140250360,254,101,110
9101 DATA 34,31,28,35,32,29,36,33,30, 39,42,45,38,41,44,37,40,43, 227
9110 DATA AL320650980,7,4,1,8,5,2,9,6,3, 137, 21,24,27,20,23,26,19,22,25
9111 DATA 110,146,128
9120 DATA AR120450780,3,6,9,2,5,8,1,4,7, 128, 25,22,19,26,23,20,27,24,21
9121 DATA 146, 110, 137
9130 DATA TL321000000,7,4,1,8,5,2,9,6,3, 37,38,39,13,14,15,16,17,18, 119
9131 DATA 10,11,12,31,32,33,34,35,36, 46,47,48,40,41,42,43,44,45, 28,29,30,49,50,51,52,53,54
9140 DATA TR123000000,3,6,9,2,5,8,1,4,7, 28,29,30,13,14,15,16,17,18, 119
9141 DATA 46,47,48,31,32,33,34,35,36, 10,11,12,40,41,42,43,44,45, 37,38,39,49,50,51,52,53,54
9150 DATA BL987000000,101, 10,11,12,13,14,15,43,44,45, 21,24,27,20,23,26,19,22,25
9151 DATA 28,29,30,31,32,33,16,17,18, 37,38,39,40,41,42,52,53,54, 46,47,48,49,50,51,34,35,36
9160 DATA BR789000000,101, 10,11,12,13,14,15,34,35,36, 25,22,19,26,23,20,27,24,21
9161 DATA 28,29,30,31,32,33,52,53,54, 37,38,39,40,41,42,16,17,18, 46,47,48,49,50,51,43,44,45
9170 DATA F+123698000,1,2,3,4,5,6,36,33,30, 16,13,10,17,14,11,18,15,12, 43,40,37,22,23,24,25,26,27
9171 DATA 28,29,19,31,32,20,34,35,21, 7,38,39,8,41,42,9,44,45, 146
9180 DATA F-789632000,1,2,3,4,5,6,37,40,43, 12,15,18,11,14,17,10,13,16, 30,33,36,22,23,24,25,26,27
9181 DATA 28,29,9,31,32,8,34,35,7, 21,38,39,20,41,42,19,44,45,146
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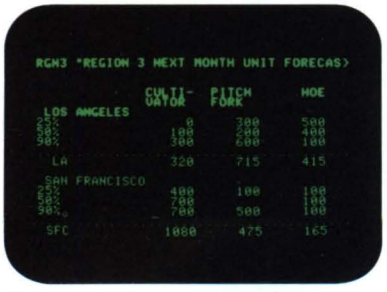

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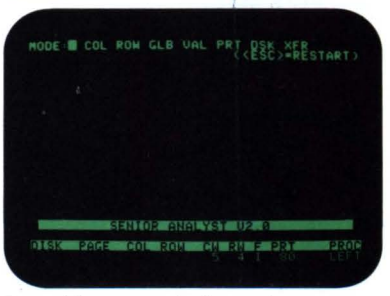

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Make Your Micro Spell Out Cold, Hard Cash

Although this Microsoft Basic program won't keep your checks from bouncing, it will make check-writing a whole lot easier.

By Van Wolverton

Business programs—especially accounts payable and check registers—often include routines for writing checks. Formatting the output isn't difficult, thanks to widespread standardization in check forms.

The seemingly trivial task of converting the dollar amount to words, however, is more of a challenge. Some check-writing routines omit the conversion, simply printing the amount preceded and followed by asterisks, but ***** 127.56 ***** just isn't the same as "One hundred twenty-seven and 56/100 dollars."

The subroutine described here converts a number to its equivalent in English words, following grammatical rules for correct formation of a numeric phrase. Given an input amount, it returns a string that contains a properly-formed phrase stating the dollar amount in words followed by "and," the number of cents and "/100 dollars." If there are no cents, the dollar amount is preceded by "Exactly." If there are no dollars, the word "None" appears instead of the numeric phrase.

System Requirements

This subroutine is written in Microsoft Basic, using long variable names that require version 5.0 or later. Most systems used to run business programs have sufficient memory to accommodate the subroutine, which requires about 3000 bytes.

Because of the way the output string is built, string space usage grows with the size of the number being converted. Up to $999, about 500 more bytes are used during execution; up to $9999, about 700 more bytes are used.

I've included a listing of a compressed version that requires about 2000 bytes less than the main listing, if space in your system is at a premium. This version should run with any version of Microsoft Basic.

The indentations in the main listing are produced by using Line Feed (CTRL-J) to start the new lines and blanks (or tabs) to space in from the left margin. You can omit the indentations and remarks to save space, but this makes the subroutine listing less understandable.

Complicating Factors

The logic of this type of conversion routine can get convoluted because of several complicating factors:

- Although most decades (spans of 10, such as 20–29) can be handled consistently, the first (10–19) requires special treatment.
- The number to be converted can vary in length from one character (a dollar value from one to nine with no cents) to whatever maximum length the routine must be able to handle ($99,999.99, for example, requires eight characters if the dollar sign and comma aren't included). This eliminates translation based on powers of 10.
- Rounding errors can occur, especially if double-precision numbers are used to preserve accuracy.
- The program must handle whole dollar values (no cents).
- The program should handle decimal fractions with no dollar part (.75, for example), although checks for less than a dollar are rare.

This subroutine, like most approaches to the problem, deals with a string that represents the number. In Basic, this is a simple task using the STR$ function; STR$(127.56), for example, returns the string " $127.56". Don't forget the blank before the first digit; the STR$ function always includes it.

Simplifying Factors

The subroutine simplifies the conversion process by making an assumption about the form of the data it receives and conditioning the data before processing it.

The number to be converted is assumed to be a string whose characters represent the amount of the check (with *no* preceding blank). No assumption is made about its form, however; the string can represent an integer, a decimal fraction or a real number with integer and decimal fraction parts. Any number of digits can follow the decimal point. After it is checked for validity, the input string is divided into dollar and cent strings.

The conditioning guarantees that the cent string (if there are any cents) consists of a decimal point followed by exactly two digits. If more than two digits follow the decimal point, the additional digits are truncated (no rounding is performed).

The conditioning of the dollar string is the key to the conversion technique. It is padded with leading 0s, if necessary, to make its length an integral multiple of three. The length of the dollar string divided by three, then, is the highest multiplier in the number of dollars.

The padded dollar string (Fig. 1) always consists of an integral number of groups of three digits. Within each group, the first digit represents hundreds, the second represents tens and the third represents units.

If there is one group of three digits, that group represents units. If there are two groups of three digits, the first represents thousands and the second represents units. If there are three groups of three digits, the first represents millions, the second represents thousands and the third represents units. Fig. 2 shows several

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Input Dollar String	*Padded Dollar String*	
1	001	
12	012	
123	123	(no padding)
1234	001234	
12345	012345	
123456	123456	(no padding)
1234567	001234567	
12345678	012345678	
123456789	123456789	(no padding)

etc.

Fig. 1. Method in which dollar strings are padded.

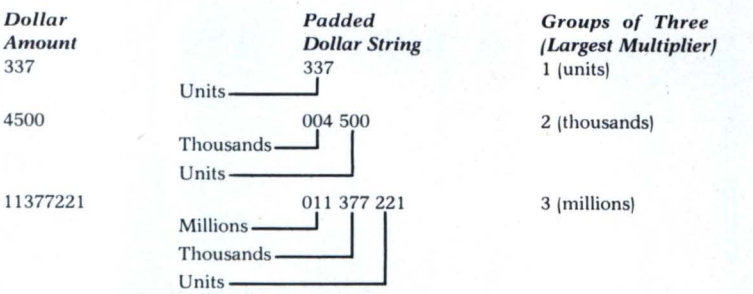

Fig. 2. Method in which three-digit groups represent the largest multiplier.

dollar strings after conditioning, divided into groups of three digits to show how this makes it possible to process a number from left to right and calculate the proper multiplier.

The subroutine accurately converts dollar strings up to 15 digits, but it's simple to increase this range if you must write a check for a quadrillion dollars or more. (Who says microcomputers aren't powerful enough for big jobs?)

Program Description

A printout of the subroutine is shown in Listing 1. The only GOTO statement (line 5040) branches to itself, so it should be relatively easy to include the subroutine in an existing program using whatever statement numbers are available.

Initialize Word Arrays (500–640)—This is actually a separate subroutine that should be called once before repeatedly calling the conversion subroutine. There's no point in initializing each time a number is converted.

Statements 520–600 initialize the string arrays (UNITS$, TENS$ and MULT$) that contain the words to be printed on the check. UNITS$ contains "one" through "nineteen," TENS$ contains "twenty" through "ninety" and MULT$ contains "thousand" through "trillion." To expand the range of the subroutine, you need only add the words for the additional multipliers (quadrillion, quintillion, etc.) to statement 630.

Initialize Strings and Verify Input (1000–1020)—Statement 1010 initializes the strings for dollars, cents and the words to be printed (CHECK$) and for null. If the value represented by the input string (AMOUNT$) is less than one cent, statement 1020 sets the output string to ***VOID*** and returns. The calling program can check the returned string to verify correct output.

Separate into Dollar and Cent Strings (2000–2010)—Statement 2010 extracts dollar and cent strings from the input string. If there is no decimal point in the input string, the cent string remains null. Only the first two digits following the decimal point are included in the cent string; this is the point to do any rounding if you feel you must.

If the cent string consists of two zeros, statement 2020 sets it to null and sets the input string equal to the extracted dollar string. This guarantees consistent treatment of equivalent input strings that represent an even dollar amount.

Condition Input Data (3000–3030)—Statement 3010 adds "0" to the cent string if only one digit follows the decimal point in the input string. Statement 3020 adds one or two leading 0s, if necessary, to make the length of the dollar string a multiple of three. (The reason for this was described earlier under "Simplifying Factors.")

Convert Dollars to Words (4000–4100)—Now that the input data is conditioned and divided into dollar and cent strings, the actual conversion can be done. The string variable CHECK$ is used to hold the words to be printed on the check.

The index of the loop ("I" in statement 4010) is set to the number of groups of three digits in the dollar string—LEN(DOLLARS$)/3—and steps down to 1. The initial value of I, then, is the highest multiplier (hundreds, thousands, etc.) in the dollar value.

Each pass through the loop adds the words to CHECK$ that correspond to the value of the current group of three digits, then adds the word that represents the multiplier and finally strips the leftmost three digits from the string.

First, statements 4020–4040 set three variables (DIGIT1, DIGIT2 and DIGIT3) to the value of each digit in the group. Within each group of three digits, DIGIT1 represents hundreds, DIGIT2 represents tens and DIGIT3 represents units.

Next, four IF statements select the words from UNITS$ and TENS$ that correspond to the values of DIGIT1, DIGIT2 and DIGIT3, and add them to CHECK$:

- If DIGIT1 is greater than 0, statement 4050 adds the word from UNITS$ that corresponds to its value plus the word "hundred."
- If DIGIT2 is 0, statement 4060 adds the word from UNITS$ that corresponds to the value of DIGIT3.
- If DIGIT2 is one, statement 4070 adds the word from UNITS$ that corresponds to ten times the value of DIGIT2 plus the value of DIGIT3. This takes care of the troublesome "teens."
- If DIGIT2 is greater than one, statement 4080 adds the word from TENS$ that corresponds to its value, then checks the value of DIGIT3. If it is greater than 0, a hyphen followed by the word from UNITS$ that corresponds to its value is added; if not, a space is added.

After a pass through the loop is completed, statement 4090 checks to see if it is the last pass. If not, the leftmost three characters are removed

for the next pass. Then, if the sum of the three digits just processed is greater than 0, the word from MULT$ corresponding to the multiplier is added to CHECK$. (The value of the sum of the digits is checked to prevent such errors as 1,000,000 printing "one million thousand." It *could* matter.)

Cents and Cleanup (5000–5050)—If there are no dollars (if the check is for 99 cents or less), statement 5060 sets CHECK$ to NONE. (Because capitalizing the first word is saved until the phrase is complete, it is actually set to nONE.) If there are no cents, statement 5020 puts the word eXACTLY at the beginning of CHECK$, followed by " dollar" if the check is for exactly $1 or by " dollars" if not. Otherwise, it adds the cents followed by "/100 dollars."

Statement 5030 capitalizes the first word and statement 5040 cleans up double blanks that are added in some instances. (Changing the logic of the loop to insert correct spacing in all instances takes significantly more storage and processing time than stripping out multiple blanks at this point.)

Listing 1. Microsoft Basic subroutine that converts numbers to English words.

Microcomputing welcomes conversions of this program for the Apple, Atari, Commodore, Heath and IBM microcomputing systems.

```
500
*******************************************
*  INITIALIZE WORD ARRAYS                 *
*******************************************
510 DIM UNITS$(19)
520 FOR I = 1 TO 19
530     READ UNITS$(I)
540     NEXT I
550 FOR I = 2 TO 9
560     READ TENS$(I)
570     NEXT I
580 FOR I = 2 TO 5
590     READ MULT$(I)
600     NEXT I
610 DATA one,two,three,four,five,six,seven,eight,nine,ten,eleven,twelve,
       thirteen,fourteen,fifteen,sixteen,seventeen,eighteen,nineteen
620 DATA twenty,thirty,forty,fifty,sixty,seventy,eighty,ninety
630 DATA thousand,million,billion,trillion
640 RETURN
1000 '

*******************************************
*  INITIALIZE STRINGS AND VERIFY INPUT    *
*******************************************
1010 CHECK$  = "":
     DOLLAR$ = "":
     CENTS$  = ""
1020 IF VAL(AMOUNT$) < .01 THEN
        CHECK$ = "*** VOID ***":
        RETURN
2000 '
*******************************************
*  SEPARATE INTO DOLLAR AND CENT STRINGS  *
*******************************************
2010 DECPT = INSTR(AMOUNT$,"."):
     IF DECPT = 0
        THEN DOLLARS$ = AMOUNT$
        ELSE DOLLARS$ = LEFT$(AMOUNT$,DECPT-1):
             CENTS$ =  MID$(AMOUNT$,DECPT+1,2)
2020 IF VAL(CENTS$) = 0 THEN
        CENTS$ = "":
        AMOUNT$ = DOLLARS$
3000 '
*******************************************
*  CONDITION INPUT DATA                   *
*******************************************
3010 IF LEN(CENTS$) = 1 THEN CENTS$ = CENTS$ + "0"
3020 IF LEN(DOLLARS$) MOD 3 > 0
        THEN DOLLARS$ = STRING$(3-LEN(DOLLARS$) MOD 3,"0") + DOLLARS$
4000 '
*******************************************
*  CONVERT DOLLAR STRING TO WORDS         *
*******************************************
4010 FOR I = LEN(DOLLARS$)/3 TO 1 STEP -1
4020     DIGIT1 = VAL(LEFT$(DOLLARS$,1))
4030     DIGIT2 = VAL(MID$(DOLLARS$,2,1))
4040     DIGIT3 = VAL(MID$(DOLLARS$,3,1))
4050     IF DIGIT1 > 0 THEN CHECK$ = CHECK$ + UNITS$(DIGIT1) + " hundred "
4060     IF DIGIT2 = 0 THEN CHECK$ = CHECK$ + UNITS$(DIGIT3) + " "
4070     IF DIGIT2 = 1 THEN CHECK$ = CHECK$ + UNITS$(DIGIT2 * 10 + DIGIT3) + " "
4080     IF DIGIT2 > 1  THEN
            CHECK$ = CHECK$ + TENS$(DIGIT2):
            IF DIGIT3 > 0 THEN CHECK$ = CHECK$ + "-" + UNITS$(DIGIT3) + " "
                          ELSE CHECK$ = CHECK$ + " "
```

More

If You Must Round

The subroutine sacrifices rounding for simplicity. Because it deals with strings, not numeric variables, rounding is somewhat complicated. Replacing statement 3040 with the following statement rounds the cents string instead of truncating it:

```
3040 IF LEN(CENTS$)>2 THEN CENTS$ =
MID$(STR$(VAL(LEFT$(CENTS$,2)) + CINT
(VAL("." + MID$(CENTS$,3)))),2)
```

This converts the third and subsequent digits of the cents string to a decimal fraction, then rounds to an integer (either 0 or 1) and adds the result to the value of the first two digits. But it doesn't round the dollars; .99 is "rounded" to .10, so 13.995 is "rounded" to 13.10, not 14.

Dollars could be rounded, of course, by adding more logic to the subroutine, but rounding really shouldn't be done here. Rounding should be done in the calculations of the program that calls this subroutine; accumulated errors in calculation are much more serious than a potential one-cent error in printing a check. Besides, if the rounding is done in the calculating program, there is no potential for error in printing the check.

Was It Really Worth It?

There are a few lessons you can learn here:

- It's possible to write clear, understandable programs in Basic, at the expense of some memory.
- If you do more than a little Basic programming, it's probably worthwhile to invest in a program that compresses the source code (unless you intend to compile it).
- Spending some time and memory to condition input data can reduce the overall time and memory required. By doing this, you are defining the parameters of the problem rather than letting the problem drive your solution.
- If you find yourself spending inordinate amounts of time or program space trying to handle one or two minor features of a program, look for simplifying assumptions or techniques (such as not allowing blanks, commas or leading 0s in the input string; deciding not to round; or deleting multiple blanks rather than trying to put in the correct number under all possible circumstances).

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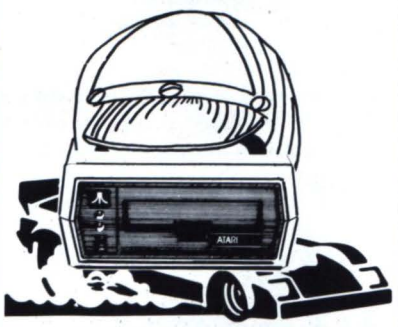

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Listing 1 continued.

```
4090      IF I > 1 THEN
             DOLLARS$ = MID$(DOLLARS$,4):
             IF DIGIT1 + DIGIT2 + DIGIT3 > Ø THEN CHECK$ = CHECK$ + MULT$(I) + " "
4100      NEXT I
5000 '

*****************************************
*  ADD CENTS AND CLEAN UP               *
*****************************************
5010 IF CHECK$ = "" THEN CHECK$ = "nONE"
5020 IF CENTS$ = ""
        THEN CHECK$ = "eXACTLY " + CHECK$:
           IF VAL(AMOUNT$) = 1
              THEN CHECK$ = CHECK$ + " dollar"
              ELSE CHECK$ = CHECK$ + " dollars"
        ELSE CHECK$ = CHECK$ + " and " + CENTS$ + "/100 dollars"
5030 MID$(CHECK$,1,1) = CHR$(ASC(MID$(CHECK$,1,1))-32)
5040 DBLANK = INSTR(CHECK$,"  "):
     IF DBLANK THEN
        CHECK$ = LEFT$(CHECK$,DBLANK) + MID$(CHECK$,DBLANK+2):
        GOTO 5040
5050 RETURN
```

```
100 GOSUB 500                                   '* INITIALIZE STRINGS
110 INPUT "Amount of check: ", AMOUNT$
120 GOSUB 1000                                  '* CONVERT TO WORDS
130 PRINT CHECK$
140 PRINT
150 IF AMOUNT$ <> ""
       THEN GOTO 110
       ELSE END

run
Amount of check: 123.95
One hundred twenty-three and 95/100 dollars

Amount of check: 10001.01
Ten thousand one and 01/100 dollars

Amount of check: .99
NONE and 99/100 dollars

Amount of check: 2500
EXACTLY two thousand five hundred dollars

Amount of check: 1
EXACTLY one dollar

Amount of check:
*** VOID ***
Ok
```

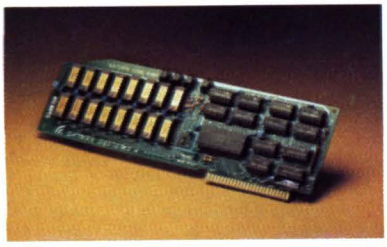
Listing 2. Test program and sample run.

```
510 DIM A$(19):FOR I=1 TO 19:READ A$(I):NEXT:FOR I=2 TO 9:READ B$(I):NEXT:FOR I=
    2 TO 5:READ C$(I):NEXT
610 DATA one,two,three,four,five,six,seven,eight,nine,ten,eleven,twelve,thirteen
    ,fourteen,fifteen,sixteen,seventeen,eighteen,nineteen,twenty,thirty,forty
    ,fifty,sixty,seventy,eighty,ninety,thousand,million,billion,trillion
640 RETURN
1010 D$="":E$="":F$="":IF VAL(G$)<.01 THEN D$="*** VOID ***":RETURN
2010 A=INSTR(G$,"."):IF A=Ø THEN E$=G$ ELSE E$=LEFT$(G$,A-1):F$= MID$(G$,A+1,2):
    IF VAL(F$)=Ø THEN F$="":G$=E$
3010 IF LEN(F$)=1 THEN F$=F$+"Ø"
3020 IF LEN(E$) MOD 3>Ø THEN E$=STRING$(3-LEN(E$) MOD 3,"Ø")+E$
4010 FOR I=LEN(E$)/3 TO 1 STEP -1:B=VAL(LEFT$(E$,1)):C=VAL(MID$(E$,2,1)):D=VAL(M
    ID$(E$,3,1)):IF B>Ø THEN D$=D$+A$(B)+" hundred "
4060 IF C=Ø THEN D$=D$+A$(D)+" "
4070 IF C=1 THEN D$=D$+A$(C*10+D)+" "
4080 IF C>1 THEN D$=D$+B$(C):IF D>Ø THEN D$=D$+"-"+A$(D)+" " ELSE D$=D$+" "
4090 IF I>1 THEN E$=MID$(E$,4):IF B+C+D>Ø THEN D$=D$+C$(I)+" "
4100 NEXT:IF D$="" THEN D$="nONE"
5020 IF F$=""THEN D$="eXACTLY "+D$:IF VAL(G$)=1 THEN D$=D$+" dollar" ELSE D$=D$+
    " dollars"ELSE D$=D$+" and "+F$+"/100 dollars"
5030 MID$(D$,1,1)=CHR$(ASC(LEFT$(D$,1))-32)
5040 E=INSTR(D$,"  "):IF E THEN D$=LEFT$(D$,E)+MID$(D$,E+2):GOTO 5040
5050 RETURN
```

Listing 3. Compressed version requires two-thirds less memory but is harder to follow.

I run out of memory?"

Most people *do* run out of memory *with only 18K VisiCalc** workspace. But you can expand your Apple II* to 177K VisiCalc memory! You can also get 80-column display, lower case letters, and hard disk support—all without buying a bigger computer.



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Circle 117 on Reader Service card.

Whoa, Apple Video

This modification of a previously published Apple program is for disk use and gives you manual control over the speed of video output.

By Craig Marley

For Apple II users who don't have an Autostart ROM, the two programs by Terry Phillips in the October 1980 *Microcomputing* ("Whoa, Apple," p. 132) are among the most useful. However, they will not work with Apple DOS. This modification of the first program is for disk use.

I've made two improvements to the original program. The first change is to make it work with DOS, while the second is a matter of convenience: The user only has to tap one key to toggle between stop and go.

To make the program work with DOS, JSR $03EA is added to the subroutine which places the program entry address into 36 and 37 (hexadecimal). This passes the information in 36 and 37 to DOS.

The second change necessitates modifying the code so that only one keyboard character toggles the list. Type the key once and the list stops and type the same key again to resume listing. Location 2F3 (hex) is the chosen hex keyboard character. 93 (hex) in this location gives a CTL-S. This means you can hold the CTL key down with your left hand and tap the S key to toggle the list.

To save on disk after typing in the program, type BSAVE WHOA, A$2DB, L$25. When you wish to use it, BLOAD WHOA. Then load Basic and Call 731.■

```
          DOS WHOA!

ADDR      CODE      LABLE     MNEMONIC          COMMENT

                              ORG     $02DB
02DB      A9E7                LDA     #$E7      ;PLACE DELAY SUBROUTINE
02DD      8536                STA     $36       ;ADDRESS IN LOCATIONS
02DF      A902                LDA     #$02      ;0036 & 0037
02E1      8537                STA     $37
03E3      20EA03              JSR     $03EA     ;PASS TO DOS
02E6      60                  RTS               ;RET. TO BASIC

02E7      08        ENTRY     PHP               ;STORE Z
02E8      48                  PHA               ;STORE A
02E9      18        FGCLR     CLC               ;CLR C FLAG
02EA      AD00C0    RKYBD     LDA     $C000     ;KEY PRESSED?
02ED      100A                BPL     $02F9     ;IF NO JMP
02EF      2C10C0              BIT     $C010     ;ELSE CLR KYBD
02F2      4993                EOR     #$93      ;WAS KEY CTL-S?
02F4      D003                BNE     $02F9     ;IF NO SKIP
02F6      B0F1                BCS     $02E9     ;IF CY SET THEN CLEAR
02F8      38                  SEC               ;ELSE SET CY
02F9      B0EF      FLGCK     BCS     $02EA     ;IF CY SET THEN RKYBD
02FB      68                  PLA               ;GET A
02FC      28                  PLP               ;GET Z
02FD      4CF0FD    EXIT      JMP     $FDF0     ;JMP TO VIDEO
                                                ;OUTPUT ROUTINE
```

Program listing. Apple DOS modification.

Address correspondence to Craig Marley, PO Box 2456, Station B, Kitchener, Ontario, Canada N2H 6M3.

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Circle 338 on Reader Service card.

Don't Gum Up the Works!

Organize your Apple diskettes with catalog listings on 5- by 1½-inch gummed labels.

By Allan L. Rogers

Listing 1. Applesoft program to list disk contents.

```
10  REM   CATALOG LABELS PRINTING PROGRAM
12  REM   ALLAN L. ROGERS
14  REM   BONITA, CALIFORNIA
16  REM
88  REM    LOMEM IS SET 200 BYTES ABOVE END OF PROGRAM,
89  REM    LEAVING ROOM FOR MACHINE CODE BEFORE VARIABLES BEGIN
90  LOMEM:  PEEK (175) +  PEEK (176) * 256 + 200
95  TEXT : HOME
97 D$ =  CHR$ (13) +  CHR$ (4):BELL$ =  CHR$ (7) +  CHR$ (7)
98 SLOT = 1
99 PRNT$ = "PR#" +  STR$ (SLOT)
100  VTAB 5
110 A$ = "*****************************************": GOSUB 7000
115  PRINT : PRINT
120 A$ = "CATALOG LABELS PRINTING PROGRAM": GOSUB 7000
130  PRINT : PRINT
140 A$ = "INSTALLING MACHINE CODE": GOSUB 7000
150  PRINT : PRINT
160 A$ = "*****************************************": GOSUB 7000
500  GOSUB 1000: IF ER THEN 900
510  GOSUB 2000
520  GOSUB 5000
598  REM  ******************************************************
599  REM  MAIN BODY OF PROGRAM
600  HOME : VTAB 10
610 A$ = "TYPE 'Y' TO PRINT A LABEL": GOSUB 7000
620  PRINT :A$ = "HIT 'N' TO EXIT": GOSUB 7000
630  GET A$: IF A$ = "N" THEN 900
635  IF A$ <  > "Y" THEN 600
640  GOSUB 6000
650  GOTO 600
651  REM  ******************************************************
900  PRINT : PRINT : PRINT :A$ = "PROGRAM TERMINATED": GOSUB 7000:
     PRINT BELL$;BELL$;
997  END
998  REM
999  REM   ******************************************************
1000  REM  LOCATES DOS & ADDRESS OF DOS CATALOG FUNCTION HANDLER
1005  REM   RETURNS WITH ER=255 IF NO VALID DOS FUNCTION HANDLER
1010 DOS =  PEEK (978): REM  FIRST PAGE OF DOS
1015 FUNC = DOS * 256 + 4248: REM  CATALOG FUNCTION HANDLER
1029  REM    SAVE VALUES OF EXISTING JUMP AT FUNC
1030 A1 =  PEEK (FUNC):A2 =  PEEK (FUNC + 1):A3 =  PEEK (FUNC + 2)
1034  REM   VERIFIES PROPER JUMP INSTRUCTION AT FUNC
1035 ER = 0
1040  IF A1 = 32 AND A2 + A3 * 256 = FUNC - 444 THEN 1060
1045 ER = 255
1050  HOME : VTAB 10
1055  PRINT BELL$:A$ = "STANDARD DOS": GOSUB 7000
1056  PRINT : PRINT :A$ = "NOT RESIDENT IN THIS MACHINE": GOSUB 7000
1060  RETURN
1999  REM   ******************************************************
2000  REM    POKES MACHINE  CODE BETWEEN END OF PROGRAM & LOMEM
2010 RTN =  PEEK (175) +  PEEK (176) * 256 + 5:LNGTH = 149
2020  FOR I = RTN TO RTN + LNGTH
2040  READ A
2045  IF A < 0 THEN A =  ABS (A) + DOS: REM  ADJUSTS ABS JMP TO
     PROPER DOS PAGE
```

(continued on page 104)

How often have you mixed up your growing library of disks, forgetting on which disk you have saved that program you need right now? If you're like me, you sometimes forget to write down an addition or change to the contents of your disk library, and it's often hard to quickly determine where that needed program is hidden.

This handy utility, written for the Apple II in Applesoft Basic and 6502 assembly language, and using the compressed print mode of the Epson MX-80 printer, has helped me solve this problem. It produces a compact listing of the disk contents (see Fig. 1) on 5 × 1½ inch gummed labels, which you can then affix to the envelope or disk itself. Or, by simply changing five parameters, you can produce many different formats of catalog listings.

The idea for the program came to me as I was reading the informative and helpful book, *Beneath Apple DOS*, by Don Worth and Pieter Lechner. While reading their narrative description of Apple DOS routines, I came across the Catalog function handler. As I compared their description with the Apple monitor disassembly of the routine, it occurred to me that I could reconfigure the catalog output to a form more useful than the long, single-column format provided by Apple.

The program in Listing 1 is the

Address correspondence to Allan L. Rogers, 4021 Allen School Road, Bonita, CA 92002.

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result. It simply bypasses the Apple DOS Catalog function handler and uses my custom 6502 assembly-language routine contained in lines 3000 to 3060.

Program Operation

The program uses several tricks to provide maximum flexibility with different systems. In line 90, LOMEM, which is where Basic begins storing variables, and which normally points to the end of the Basic program, is reset to 200 bytes beyond the end of the program. This allows enough room to compile the machine code between the end of the program and the beginning of the variable storage area.

Since the machine code "floats" in RAM as the Basic program is modified, it must be relocatable. Fortunately, the 6502 CPU contains the needed relative address branch instructions. There is only one absolute address subroutine call within the machine code that requires explicit relocation. This is done in lines 2070-2080.

The machine code makes several calls to Apple DOS routines. Therefore, I wrote the program to initialize with either 16K, 32K or 48K systems. Variable DOS in line 1010 stores the base address of Apple DOS. The variable FUNC in line 1015 points to the Apple DOS Catalog function handling routine. The first three bytes of that routine are checked in line 1040 to confirm that everything is in order. If there is a discrepancy, the program is aborted here before any changes to DOS are made.

The machine code is installed between the end of the program and LOMEM in lines 2000-2060, using the data in 3000-3090. The actual adjustment for calls to Apple DOS is done in line 2045. Negative data represents the absolute offset from the first page of the DOS. By adding that offset to the Apple DOS base saved in variable DOS, the proper routine within DOS is called.

The parameters affecting the format of the catalog printout are given in lines 3015, 3025, 3050, 3075 and 3085. By altering them, you can create a variety of formats to meet differing needs.

The only change in Apple DOS occurs in lines 4000-4520. Line 4010 pokes a Jump instruction into the first three bytes of the DOS Catalog function handler, directing the calling routine to the newly loaded machine code. Line 4510 restores the original three bytes. The first change is called just prior to calling the Catalog function, and the last is called immediately after.

If Apple DOS is not restored properly, you run the risk of crashing your system the next time you enter the Catalog command. Therefore, if you need to interrupt the Catalog function before it is completed, type GOSUB 4500 before you make any changes to the program or otherwise erase the variables in A1, A2 and A3.

The slot for your printer interface is varied in line 98 and saved in vari-

```
IS THIS FIRST LINE ON LABEL?
```

```
A:HELLO                    !B:BOOT13                  !B:COPY.OBJ0               !
A:COPY                     !B:FID                     !B:INTBASIC                !
B:MASTER CREATE            !B:MUFFIN                  !B:L48                     !
A:EPSON CATALOG            !I:BINARY PROG LOCATE      !B:EDIT MACRO              !
B:AUTO PAGER               !T:MAKE EXEC (ASFT)        !T:MAKE EXEC (INT)         !
B:CTRLFIND                 !B:SLOWLIST                !B:DISK AIDE(MACHINE)      !
I:DISK AIDE(APPLE CORE)    !I:DISK AIDE(DOCUMENTATION)!A:CATALOG LABELS          !
I:TEXTFILER                !A:LIST PAGER              !A:CATALOG LABELS.BAK      !
```

```
A:AUTOLIST.SRC             !T:AUTOLIST                !T:LISTING                 !
```

```
A:HELLO                    !A:TAXMAN                  !A:MULTIPLICATION TEST     !
A:HIDDEN NUMBERS           !A:NINES                   !A:HANGMAN                 !
A:LEMONADE                 !A:YAHTZEE                 !A:HIDDEN MOUSE            !
T:AMPERMUSIC SUB           !A:MUSICAL MATH TEACHER    !A:MUSICAL LETTERS         !
A:HANGMAN.2                !A:REVERSE                 !A:GAMES SULLIVAN          !
A:BAGELS                   !A:TRAP                    !
```

```
I:APPLE HELLO              !I:CALL DEBT MARKER        !A:COMPOUND INTEREST       !
A:CRITICAL PATH ANALYSIS   !A:DECISION MAKER          !A:FED TAX PROGRAM         !
A:FORECASTING              !A:FUTURE VALUE            !A:HOME MORTGAGE           !
A:INVESTMENT EVAL.         !A:NEW CHECKBOOK           !A:PRESENT AND FUTURE VALUE!
A:SIMPLER INTEREST         !A:TAX 1040 '79            !A:TELEPHONE               !
A:TRAVEL COSTS             !T:CHECK#2                 !A:DAY OF WEEK             !
A:PLANTMAN                 !A:FILE CABINET            !T:BASENAMEFILE            !
T:APPLES HEADERFILE        !T:APPLES INDEXFILE        !T:APPLES RPTFMTNAMEFILE   !
```

```
A:HELLO                    !I:HIRES SAMPLER           !B:HIRES.OBJ               !
A:TRIF                     !I:APPLE VISION            !A:AIRFOIL                 !
A:HI-RES CHARACTER DEMO    !B:HI-RES CHARACTER GENERAT!B:CHARACTER TABLE         !
I:ENGINE                   !B:INTEGER HI-RES          !I:KALEIDOSCOPE            !
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Fig. 1. List disk contents on gummed labels, which you can then attach to your disks.

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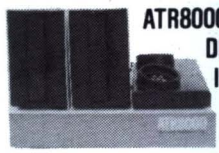

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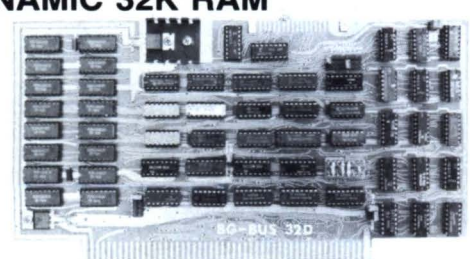

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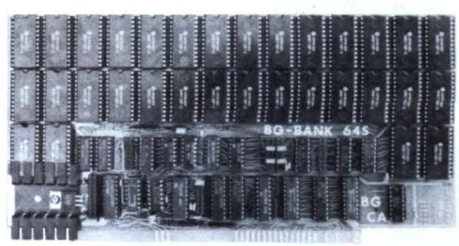

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Circle 26 on Reader Service card.

able PRNT$, line 99. The Epson compressed character mode is initialized in the normal way in line 5150. But in line 6015, it is done with a poke to the memory-mapped I/O locations using the slot number entered in line 98.

This poke prevents an extra carriage return-line feed sequence from being sent to the printer at this location in the program. It is used here to ensure compressed mode if the printer for some reason has been turned off since the last label was printed.

The assembled machine code is shown in Listing 2. Compare it with the original DOS Catalog function handler in your machine (located at $2D98, $6D98 or $AD98, depending on your system RAM). Notice I have left out the routines that print the lock/unlock status and the numbers of sectors used by each file, in order to squeeze as many catalog entries on a gummed label as possible. However, with a little comparison of the two routines, you could rewrite your own code to produce any catalog format listing you desire.■

(from page 100)

```
2050  POKE I,A
2060  NEXT I
2070  REM   RTN+112 IS ADDR OF SUBROUTINE WITHIN BODY OF CODE
2071  REM   OFFSET MUST BE ADDED TO CALL AT RTN+86 TO RELOCATE CODE
2075 A = RTN + 112
2080  POKE RTN + 86, INT (A / 256): POKE RTN + 85,A -  INT (A / 256)
    * 256
2090  RETURN
3000  REM  MACHINE LANGUAGE CODE IN DECIMAL
3010  DATA  32,220, -14,169,255,141,249,-24,32,247,175,169
3015  DATA  3: REM    3 ENTRIES/LINE
3020  DATA  141,206,3, 169
3025  DATA  8: REM    8 LINES/LABEL
3030  DATA  141,207,3, 169,141,32,237,253,24,32,17,-19
3035  DATA  176,62,162,0,142,156,-22,189,198,-23,240,52,48
3040  DATA  43,189,200,180,41,127,160,7,10,10,176,3,136,208,250,185
3045  DATA  167,-22,32,237,253,169,186,32,237,253,232,232,232,160
3050  DATA  23: REM  # CHARACTERS/ENTRY (TO 29 MAX)
3055  DATA  189,198,-23,32,237,253,232,136,16,246,32,112,16,32
3060  DATA  48,-21,144,198,176,189,169,141,32,237,253,206,207,3
3065  DATA  208,246,76,127,-22,0,0,0,0,0,169,252,32,237,253
3070  DATA  206,206,3, 208,25,169,141,32,237,253,169
3075  DATA  3: REM  3 ENTRIES/LINE
3080  DATA  141,206,3, 206,207,3 ,208,10,169,141,32,237,253,169
3085  DATA  8: REM  8 LINES/LABEL
3090  DATA  141,207,3, 96,0,0
3999  REM    ************************************************
4000  REM  DIRECTS CATALOG FUNCTION CALLS TO NEW ROUTINE
4010  POKE FUNC,76: POKE FUNC + 2, INT (RTN / 256): POKE FUNC + 1,RTN
    -  INT (RTN / 256) * 256
4020  RETURN
4500  REM   RESTORES ORIGINAL CATALOG FUNCTION ROUTINE
4510  POKE FUNC,A1: POKE FUNC + 1,A2: POKE FUNC + 2,A3
4520  RETURN
4999  REM    ************************************************
5000  REM  POSITIONS PRINT LINE AT TOP OF LABELS
5015  HOME : VTAB 5
5020 A$ = "DO LABELS NEED TO BE": GOSUB 7000
5030  PRINT :A$ = "INSTALLED AND POSITIONED": GOSUB 7000
5040  PRINT :A$ = "IN PRINTER? ": GOSUB 7000
5050  GET A$: IF A$ = "N" THEN 5300
5060  IF A$ <  > "Y" THEN 5050
5070  PRINT : PRINT
5100 A$ = "POSITION TOP OF FIRST LABEL": GOSUB 7000
5110  PRINT :A$ = "IN FRONT OF PRINT HEAD AND": GOSUB 7000
5120  PRINT :A$ = "TYPE 'Y'": GOSUB 7000
5130  GET A$: IF A$ <  > "Y" THEN 5000
5140  PRINT D$;PRNT$: REM  TURN ON PRINTER
5150  PRINT  CHR$ (15);: REM    SETS COMPRESSED MODE ON EPSON
5160  PRINT "IS THIS FIRST LINE ON LABEL? "
5165  GET A$
5170  IF A$ = "N" THEN 5150
5175  IF A$ <  > "Y" THEN 5165
5180  REM   ADVANCE TO BOTTOM OF 1ST LABEL: LINES/LABEL MINUS 1
5190  PRINT : PRINT : PRINT : PRINT : PRINT : PRINT
5200  PRINT  CHR$ (4)"PR#0"
5300  RETURN
5999  REM    ************************************************
6000  REM  PRINTS LABELS
6010  GOSUB 4000
6015  POKE 49280 + SLOT * 16,143: REM  EPSON COMPRESSED CHR
6020  PRINT D$;PRNT$;
6030  PRINT D$"CATALOG";
6040  PRINT D$"PR#0"
6050  GOSUB 4500
6060  RETURN
6999  REM    ****************************
7000  REM  PRINTS A$ IN CENTER OF SCREEN
7010  HTAB  INT ((40 -  LEN (A$)) / 2) + 1
7015  PRINT A$
7030  RETURN
```

Microcomputing welcomes conversions of this program for the Atari, Commodore, Heath and IBM microcomputer systems.

```
1786-  20 DC AB   JSR   $ABDC
1789-  A9 FF      LDA   #$FF
178B-  8D F9 B5   STA   $B5F9
178E-  20 F7 AF   JSR   $AFF7
1791-  A9 03      LDA   #$03
1793-  8D CE 03   STA   $03CE
1796-  A9 08      LDA   #$08
1798-  8D CF 03   STA   $03CF
179B-  A9 8D      LDA   #$8D
179D-  20 ED FD   JSR   $FDED
17A0-  18         CLC
17A1-  20 11 B0   JSR   $B011
17A4-  B0 3E      BCS   $17E4
17A6-  A2 00      LDX   #$00
17A8-  8E 9C B3   STX   $B39C
17AB-  BD C6 B4   LDA   $B4C6,X
17AE-  F0 34      BEQ   $17E4
17B0-  30 2B      BMI   $17DD
17B2-  BD C8 B4   LDA   $B4C8,X
17B5-  29 7F      AND   #$7F
17B7-  A0 07      LDY   #$07
17B9-  0A         ASL
17BA-  0A         ASL
17BB-  B0 03      BCS   $17C0
17BD-  88         DEY
17BE-  D0 FA      BNE   $17BA
17C0-  B9 A7 B3   LDA   $B3A7,Y
17C3-  20 ED FD   JSR   $FDED
17C6-  A9 BA      LDA   #$BA
17C8-  20 ED FD   JSR   $FDED
17CB-  E8         INX
17CC-  E8         INX
17CD-  E8         INX
17CE-  A0 17      LDY   #$17
17D0-  BD C6 B4   LDA   $B4C6,X
17D3-  20 ED FD   JSR   $FDED
17D6-  E8         INX
17D7-  88         DEY
17D8-  10 F6      BPL   $17D0
17DA-  20 F6 17   JSR   $17F6
17DD-  20 30 B2   JSR   $B230
17E0-  90 C6      BCC   $17A8
17E2-  B0 BD      BCS   $17A1
17E4-  A9 8D      LDA   #$8D
17E6-  20 ED FD   JSR   $FDED
17E9-  CE CF 03   DEC   $03CF
17EC-  D0 F6      BNE   $17E4
17EE-  4C 7F B3   JMP   $B37F
17F1-  00         BRK
17F2-  00         BRK
17F3-  00         BRK
17F4-  00         BRK
17F5-  00         BRK
17F6-  A9 FC      LDA   #$FC
17F8-  20 ED FD   JSR   $FDED
17FB-  CE CE 03   DEC   $03CE
17FE-  D0 19      BNE   $1819
1800-  A9 8D      LDA   #$8D
1802-  20 ED FD   JSR   $FDED
1805-  A9 03      LDA   #$03
1807-  8D CE 03   STA   $03CE
180A-  CE CF 03   DEC   $03CF
180D-  D0 0A      BNE   $1819
180F-  A9 8D      LDA   #$8D
1811-  20 ED FD   JSR   $FDED
1814-  A9 08      LDA   #$08
1816-  8D CF 03   STA   $03CF
1819-  60         RTS
181A-  00         BRK
181B-  00         BRK
181C-  FF         ???
181D-  FF         ???
181E-  FF         ???
181F-  FF         ???
1820-  FF         ???
1821-  FF         ???
1822-  FF         ???
1823-  FF         ???
1824-  FF         ???
1825-  FF         ???
```

Listing 2. 6502 assembly-language program for printing labels.

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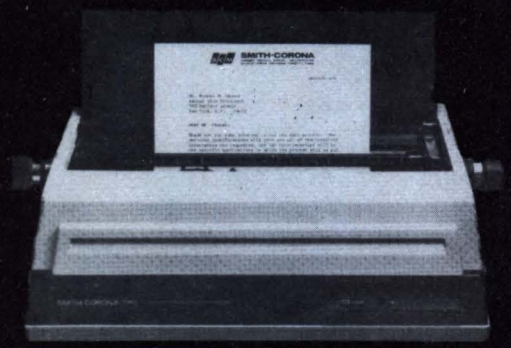

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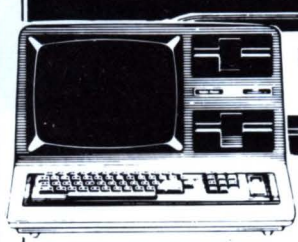

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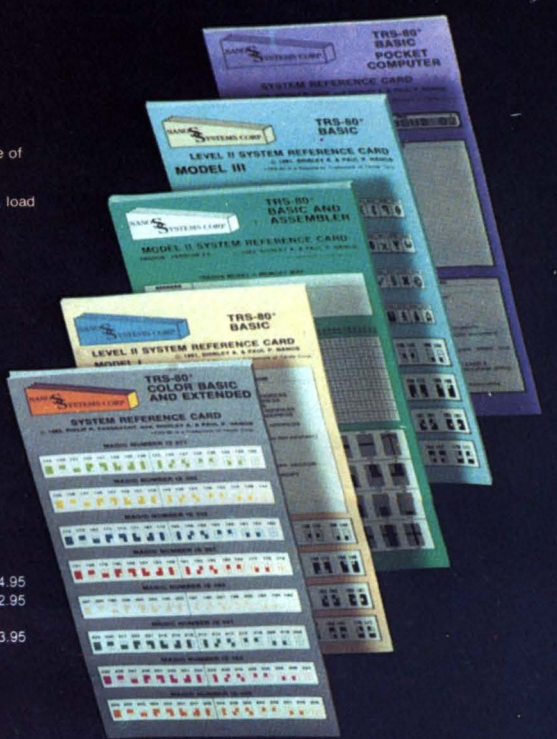

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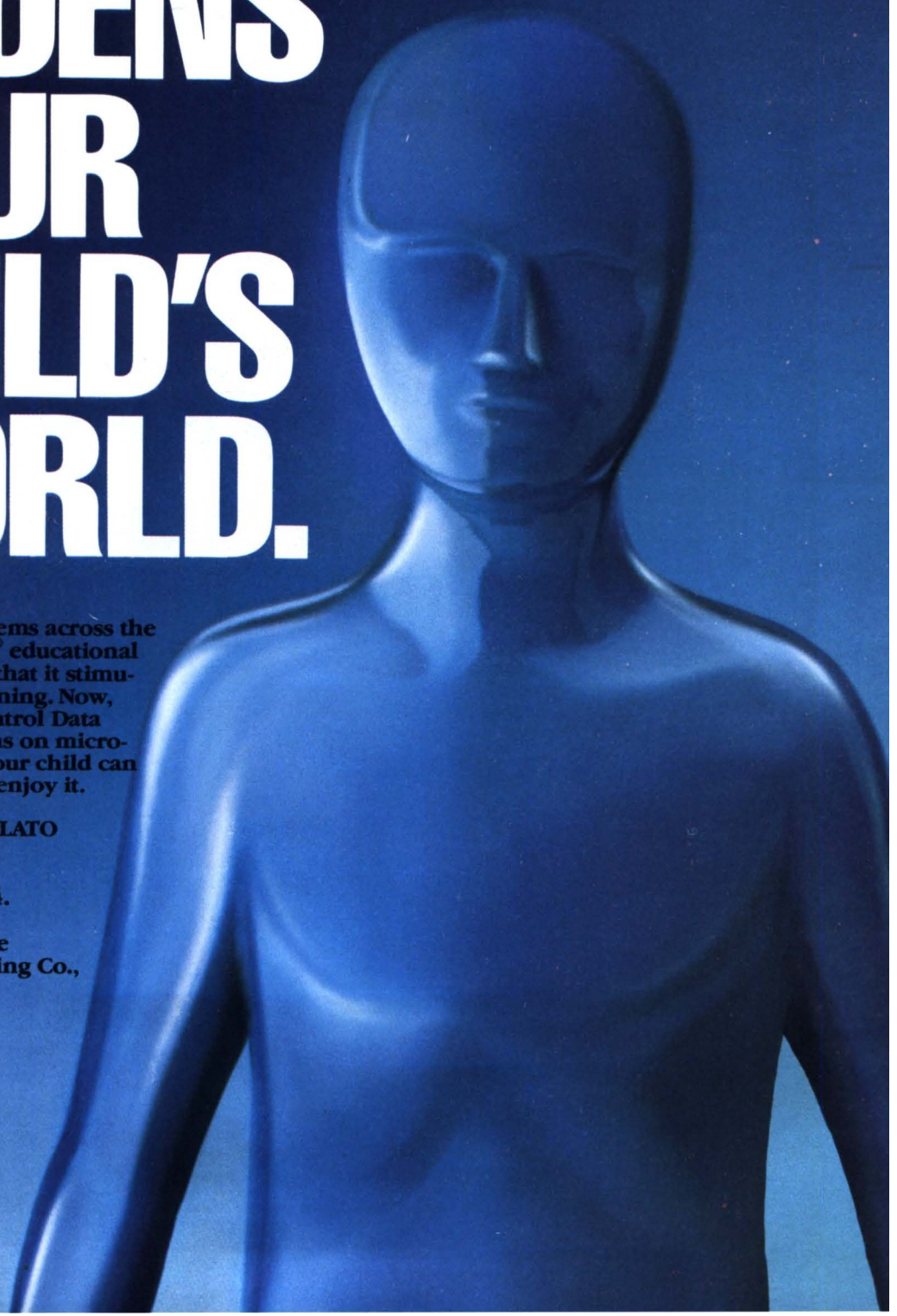

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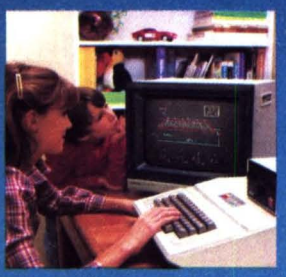

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- **Computer Literacy—Introduction:** this lesson is presented in a friendly, non-intimidating manner with touches of humor and simple, supportive graphics. It presents the history and uses of computers in today's society. Designed for junior or senior high and vocational school students.
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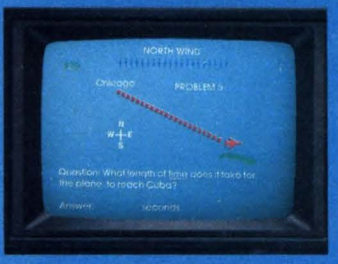

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Break Out with This Sinclair Interface

Educate your ZX81—teach it to talk to your H8 or some other outside device.

By Stephen E. Auyer

Sales of the Sinclair ZX81 computer reportedly have passed the 250,000 mark, making this unit the most widely used personal computer. But availability of hardware and software have not caught up yet, so the owner of a ZX81 has to settle for the scant offerings—or develop his own.

This simple parallel interface circuit lets you connect your ZX81 to a number of different "outside" devices. In this case the outside device is another computer, a Heath H8, but the techniques described here are general enough to apply to most devices with a parallel interface port.

Why would you want to do this? Well, there could be several reasons:

- By transferring data to the H8 you can do things with it that you could not otherwise do. You can indirectly access color displays, printers, plotters and disk drives.
- The ZX81, by virtue of its small size, low cost and built-in Basic, makes a handy remote device for collecting data or controlling a process. This interface lets you transfer summary information to a central unit (the H8).
- It's a fun experiment!

Now connecting some devices together requires nothing more than plugging in a cable and turning on the power. But the H8 and ZX81 use different clock frequencies, different microprocessors, different character sets and extensive use of interrupts so that you aren't sure what either of their microprocessors is doing at a particular time. To transfer data between the two, you need an interface circuit and some software for both the H8 and the ZX81.

There's an old saying in the computer world that just about anything that can be done with hardware can also be done with software. And that's true in this case, for there is so much interaction between the hard-

```
                        HEATH ASM #104.05.00
                      PAGE 1
                00001 *SOURCE CODE FOR MICROSOFT BASIC 'USR' ROUTINE
                00002 *
                00003 *THIS ROUTINE INPUTS AN 8-BIT WORD FROM THE SINCLAIR
                00004 *ZX81 USING THE H8-2 PARALLEL INTERFACE BOARD AND
                00005 *A CUSTOM INTERFACE CIRCUIT.
                00006 *
                00007 *THIS ASSUMES THAT THE H8-2 BOARD HAS A DATA PORT
                00008 *ADDRESSED AT 274 (OCTAL).
                00009 *
                00010 *MEMORY LOCATIONS WERE CHOSEN FOR AN H8 WITH 56K
                00011 *(THE MAXIMUM) OF MEMORY.
                00012 *
000.274         00013 DPORT  EQU   274Q
000.275         00014 SPORT  EQU   275Q
261.306         00015 USR    ORG   45510
                00016 *
                00017 *37 (DECIMAL) SETS:     TRANSMIT ENABLE
                00018 *                      DATA TERMINAL READY (LOW)
                00019 *                      RECEIVE ENABLE
                00020 *                      REQUEST TO SEND (LOW)
261.306 076 045 00021        MVI   A,37
261.310 323 275 00022        OUT   SPORT
261.312 333 275 00023 STATUS IN    SPORT  GET 8251 STATUS WORD
261.314 346 002 00024        ANI   2      MASK OFF ALL BUT BIT1 (RXRDY)
261.316 312 312 261 00025    JZ    STATUS
261.321 333 274 00026        IN    DPORT  GET THE WORD THE 8251 IS HOLDING
261.323 167     00027        MOV   M,A    AND STORE IT
                00028 *
                00029 *  16 (DECIMAL) SETS:  TRANSMIT ENABLE (OFF)
                00030 *                      DATA TERMINAL READY (HIGH)
                00031 *                      RECEIVE ENABLE (OFF)
                00032 *                      REQUEST TO SEND (HIGH)
                00033 *                      ERROR RESET
261.324 076 020 00034        MVI   A,16
261.326 323 275 00035        OUT   SPORT
261.330 331     00036        RET           RETURN TO BASIC
261.331 000     00037        END   USR
```

Listing 1. Assembled machine-code routine for H8.

Address correspondence to Stephen E. Auyer, 65 Pollock Ave., Pittsfield, MA 01201.

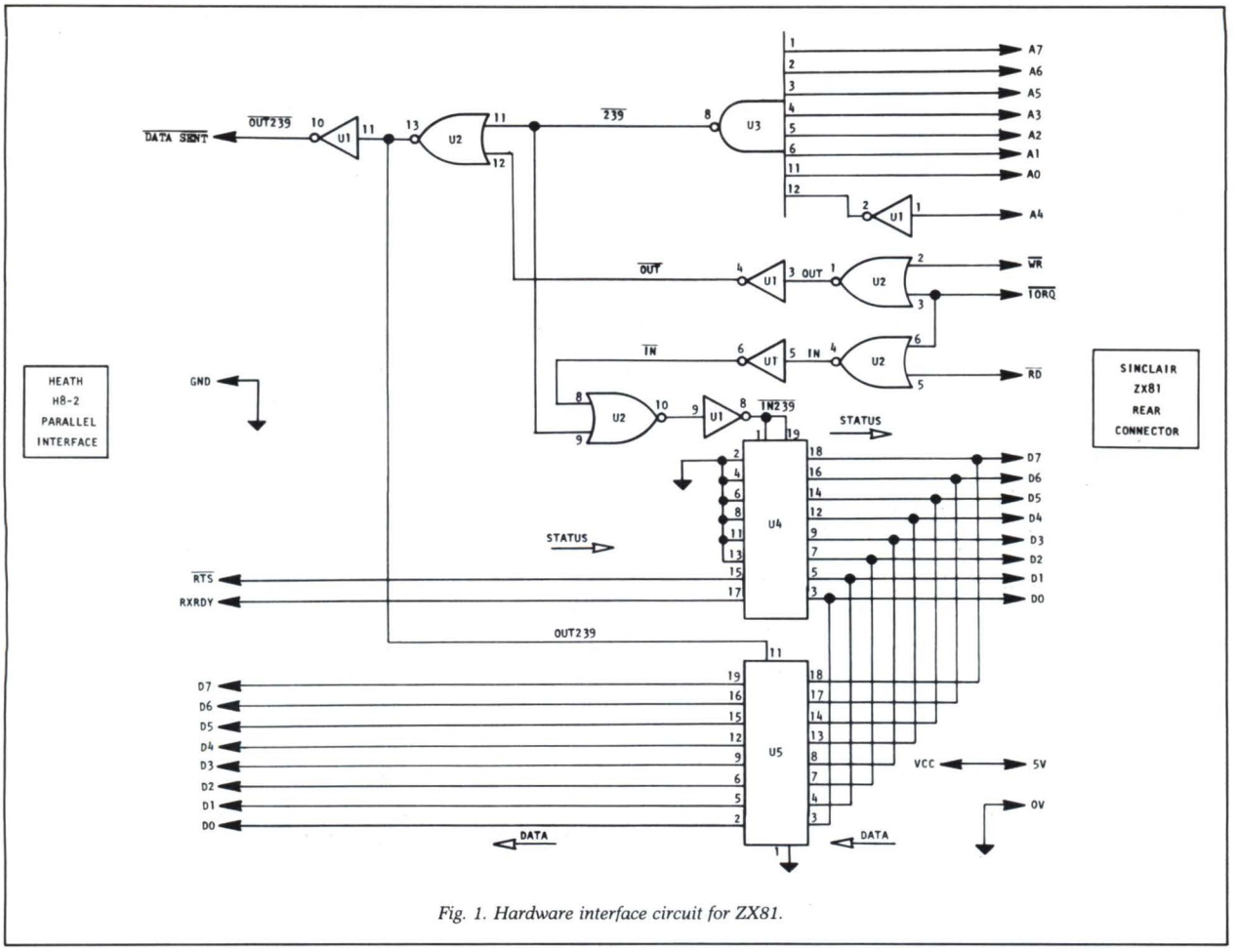

Fig. 1. Hardware interface circuit for ZX81.

ware and software that you can't understand one without understanding the other. In fact, if you wanted to modify the design, you could simplify the hardware at the expense of more complicated software, and vice versa. So I'll describe the hardware interface, then the H8 and the ZX81 software, but I'll keep referring back

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and forth to the trade-offs between the two. My goal is to tell you how to build a parallel interface for the ZX81—whether you want to connect the interface to the H8 or something else makes little difference.

Interface Circuit

The hardware interface circuit, shown in Fig. 1, uses the five chips described in Table 1. How you construct the circuit is up to you. I used a prototype board because of the speed with which the circuit can be built up (and modified). A wire-wrap board is more reliable and permanent. A printed circuit board is better still. Connections to the H8 are made via one of the 25-pin connectors on the H8-2 parallel interface board. Connections to the ZX81 are by the 46-pin rear connector.

You probably won't be able to find a custom connector for the ZX81, but you can buy a 50-pin or 100-pin circuit board connector with 0.100 inch conductor spacing and cut it to the right length. Power consumption of the interface circuit is low, thus you can "steal" power from the ZX81 by connecting the 5 V line to the VCC pins of the chips as listed in Table 1.

```
1000 REM - PROGRAM TO INTERFACE TO THE SINCLAIR ZX81
1010 REM
1020 REM - THIS PROGRAM INTERPRETS THE ZX81 DATA AS A PROGRAM LISTING
1030 REM
1040 CLEAR 1000,45000!(46000!)
1050 PRINT TAB(20);"****************************"
1060 PRINT TAB(20);"* ZX81 INTERFACE PROGRAM *"
1070 PRINT TAB(20);"****************************"
1080 PRINT: PRINT
1090 DIM D%(256),Z$(255)
1100 REM - SET UP THE ZX81 CHARACTER SET EQUIVALANCES
1110 FOR I=0 TO 255
1120 READ Z$(I)
1130 NEXT I
1140 DATA " ",,,,,,,,,,,,,,,$,":",PRINT ,(,),>,<,=,+,-,*,/,;,",",."
1150 DATA "0",1,2,3,4,5,6,7,8,9,A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T
1160 DATA "U",V,W,X,Y,Z,RND ,INKEY$ ,PI ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,""
1170 DATA "",,,,,,,,,,,,,,,,,,GRAPHICS,EDIT,ENTER,DELETE,,FUNCTION,,,,""
1180 DATA "",CURSOR,,,,,,,,,,,,,,,$,":",?,(,),>,<,=,+,-,*,/,;,","
1190 DATA ".",0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q
1200 DATA R,S,T,U,V,W,X,Y,Z,,AT ,TAB ,,CODE ,VAL ,LEN ,SIN ,COS ,TAN ,ASN ,ACS
1210 DATA ATN ,LN ,EXP ,INT ,SQR ,SGN ,ABS ,PEEK ,USR ,STR$ ,CHR$
1220 DATA NOT ,**,OR ,AND
1230 DATA <= ,>= ,<> ," THEN "," TO "," STEP ",LPRINT ,LLIST ,STOP
1240 DATA SLOW ,FAST ,NEW ,SCROLL
1250 DATA CONT ,DIM ,REM ,FOR ,GOTO ,GOSUB ,INPUT
1260 DATA LOAD ,LIST ,LET ,PAUSE ,NEXT
1270 DATA POKE ,PRINT ,PLOT ,RUN ,SAVE ,RAND ,IF ,CLS
1280 DATA UNPLOT ,CLEAR ,RETURN ,COPY
1290 REM - QUOTES AND DOUBLE QUOTES
1300 Z$(11)=CHR$(34): Z$(139)=Z$(11)
1310 Z$(192)=CHR$(34)+CHR$(34)
1320 REM - POKE IN THE MACHINE-LANGUAGE PROGRAM
1330 MO=45510!
1340 FOR I=0 TO 18
1350 READ D
1360 POKE MO+I,D
1370 NEXT I
1380 DATA &076,&045,&323,&275,&333,&275,&346,&002,&312,&312,&261
1390 DATA &333,&274,&167,&076,&020,&323,&275,&311
1400 REM - THE NEXT STATEMENTS ARE NECESSARY BECAUSE MICROSOFT BASIC
1410 REM - NEEDS AN INTEGER VALUE FOR THE USER FUNCTION ADDRESS. BUT
1420 REM - INTEGERS CANNOT BE LARGER THAN 32767.
1430 ADDR%=0
1440 D1=INT(MO/256)
1450 D0=MO-256*D1
1460 AA!=VARPTR(ADDR%)
1470 POKE AA!,D0
1480 POKE 1+AA!,D1
1490 DEF USR=ADDR%
1500 IDPRT=&0274
1510 ISPRT=IDPRT+1
1520 REM - INITIALIZE THE H8-2 PARALLEL I/O BOARD
1530 REM - RESET THE 8251
1540 D=64+16
1550 OUT ISPRT,D
1560 REM - FIRST DATA WORD
1570 D=&0116
1580 OUT ISPRT,D
1590 PRINT
1600 PRINT "=====> INITIALIZATION COMPLETE."
1610 PRINT "       READY FOR INPUT FROM ZX81."
1620 PRINT: PRINT
1630 REM - FOLLOWING STATEMENTS DECODE A ZX81 PROGRAM LINE
1640 NW=0
1650 NW=NW+1
1660 DW(NW)=USR(0)
1670 IF DW(NW)<>118 THEN 1650
1680 REM - FOUND 'ENTER', MUST BE END OF LINE
1690 IF NW=2 AND DW(1)=11! THEN 1810
1700 LN=256*DW(1)+DW(2)
1710 PRINT TAB(5);LN,TAB(11);" ";
1720 I=5
1730 IF DW(I)<>126 THEN 1760
1740 I=I+6
1750 GOTO 1780
1760 PRINT Z$(DW(I));
1770 I=I+1
1780 IF I<NW THEN 1730
1790 PRINT
1800 GOTO 1640
1810 REM - END OF TRANSMISSION
1820 PRINT: PRINT
1830 PRINT "=====> END OF ZX81 TRANSMISSION."
1840 PRINT: PRINT
1850 END
```

Listing 2. Basic program for H8 to interpret data sent by ZX81.

> It makes little difference whether you connect the ZX81 interface to the H8 or something else.

Similarly, the 0 V line of the ZX81 is connected to the GND pins of the chips. This circuit requires that the H8 and ZX81 have a common ground, so the 0 V line of the ZX81 is also connected to the H8's GND line.

A word of caution here. Depending upon the TV set used for the ZX81's display, the ZX81's 0 V line may actually have a low resistance connection to one side of the 115 V ac power line. So before you make final connections, use an ac voltmeter to check the voltage between these two lines. If a voltage is present, try reversing the TV set's line plug. If this doesn't help then you'll have to use an isolation transformer on the TV set. This step is critical since a mistake can blow the H8 and the ZX81 and possibly damage you!

Interface Circuit Operation

The signals used in the interface circuit are described in Table 2. Operation of the circuit is simple. Decoding of the ZX81's address lines is done by integrated circuit U3. This eight-input NAND gate is connected so that its output goes low whenever decimal 239 appears on the ZX81's

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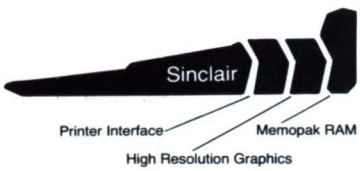

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```
                ZX81 INTERFACE PROGRAM

→INITIALIZATION COMPLETE,
 READY FOR INPUT FROM ZX81.

10      REM 0≤LOAD NEW RETURN TAB RND YYPEEK LOAD TAN FGHIJK
20      LET P$="219239230003254000194131064062000211239201"
30      FOR I=1 TO 14
40      LET J=1+3*(I-1)
50      POKE 16514+I,VAL (P$(J TO J+2))
60      NEXT I
70      LET I=16509
80      LET C=PEEK I
90      POKE 16525,C
100     LET J=USR 16515
110     LET I=I+1
120     IF I≤16970 THEN GOTO 80
130     REM—END OF TRANSMISSION
135     POKE 16525,118
136     LET J=USR 16515
140     POKE 16525,111
150     LET J=USR 16515
160     POKE 16525,118
170     LET J=USR 16515
```

Listing 3. H8 output from running program in Listing 2.

Location	Contents	Machine Code
16515	219	IN A,239
16516	239	
16517	230	AND 3
16518	003	
16519	254	CP 0
16520	000	
16521	194	JP NZ,16515
16522	131	
16523	064	
16524	062	LD A,(data)
16525	000	
16526	211	OUT 239,A
16527	239	
16528	201	RET

Listing 4. Machine-code routine for ZX81.

address lines A0 through A7. This signal is used to ensure that the interface circuit responds only to IN and OUT instructions to port 239—the ZX81 uses the ports between 240 and 255 to generate the display, control the optional printer, and read and write programs on tape.

One of the NOR gates of U2 is used to combine the $\overline{IORQ}$ and $\overline{WR}$ lines from the ZX81 to generate the $\overline{OUT}$ signal. Similarly, another NOR gate is used to combine the $\overline{IORQ}$ and $\overline{RD}$ lines to generate the $\overline{IN}$ signal. By using another NOR gate in U2 to combine the $\overline{239}$ and $\overline{OUT}$ signals, we can develop the $\overline{OUT239}$ signal, which is low whenever the ZX81 is directing data to port 239. And in like fashion, the $\overline{IN239}$ signal is generated by another NOR gate. The function of the U1 inverters is simply to change polarity of the signals.

The $\overline{OUT239}$ and $\overline{IN239}$ signals are the key signals generated by the interface circuit. They control several functions:

When the $\overline{IN239}$ signal is generated—

1. Pins 1 and 19 of U4 are pulled low. This places the inputs to U4 on the ZX81's data lines D0 through D7. At all other times the outputs of U4 are floating (high impedance) and the ZX81 data lines are not affected.

2. Since the D2 through D7 inputs to U4 are grounded, zeroes are transmitted to the ZX81 for these six bits of the data word. But the D1 input to U4 is the H8's $\overline{RTS}$ signal, and the D0 input to U4 is the H8's RXRDY signal; so when the ZX81 processor executes an IN 239 instruction, it reads the H8's status signals.

When the $\overline{OUT239}$ signal is generated—

1. Pin 11, the chip enable control, of U5 is pulled low to latch the data appearing on the ZX81 data lines D0 through D7.

2. Since pin 1, the chip output control, of U5 is always low, the latched data will be present at its output and placed on the H8's D0–D7 data lines. This data will remain there until another data word is sent by the ZX81, causing another high-to-low transition of pin 11. That is, the last data word sent by the ZX81 is always present on the H8's data lines.

3. The H8 $\overline{DATA\ SENT}$ line is pulled low to indicate that a data word has been latched into the buffer and is waiting to be read by the H8.

You need make no hardware modifications to the ZX81. But one change is necessary to the H8-2 parallel interface board. This board has a 74120 chip, as IC108, IC118 or IC128 for channels 0, 1 and 2, whose function is to provide adequate drive for the output lines and synchronize signals. These functions are not needed for the ZX81 interface and, in fact, get in the way of the handshaking signals, so that data may occasionally be lost. The solution to the problem is to remove the 74120 chip and insert two jumpers. One goes between pins 3–7 and the other between pins 9–14. With the chip removed and the jumpers in place, direct transfer of signals between the interface circuit and the H8-2 parallel interface board can take place.

```
 10 REM ABCDEFGHIJKLMNOPQRSTUVWXYZ
 20 LET P$="00100025521923923000325400020214806400520019513406406200021 1
    239201"
 30 FOR I = 1 TO 22
 40 LET J = 1 + 3*( I-1 )
 50 POKE 16514+I, VAL( P$( J TO J+2 ))
 60 NEXT I
 70 INPUT N
 80 LET N$ = STR$( N )
 90 FOR I = 1 TO LEN( N$ )
100 POKE 16533, CODE( N$(I) )

110 IF USR( 16515 ) = 0 THEN GOTO 100
120 NEXT I
130 POKE 16533, 118
140 IF USR( 16515 ) = 0 THEN GOTO 130
150 GOTO 70
```

Listing 5. ZX81 program to transfer numerical data.

Software for the Heath H8

Two pieces of software are required for the H8: a short machine-code routine that inputs an eight-bit word from the ZX81 and a longer program written in Basic that processes the data. Before delving into this software, two points must be made:

- Heath software documentation uses octal (base 8) notation rather than the decimal notation used by the ZX81 or the hexadecimal (base 16) notation used by many other manufacturers. For consistency with Heath documentation, I'll use octal notation when discussing Heath software, and decimal notation when discussing ZX81 software.
- I'll make only brief reference to the operation of the Heath H8-2 parallel interface board. See reference 1 if you want a more complete description of the operation and programming of this board.

Operation of the machine-code routine may be summarized as:

1. Tell the ZX81 that you are ready to accept an eight-bit data word.
2. Wait until a data word has been read by the H8-2 parallel interface board.
3. Transfer the word from the H8-2 board to the H8 processor and store it in memory.
4. Jump back to Basic.

Listing 1 shows the assembled machine-code routine. Lines 13 and 14 define the ports that the H8-2 card is wired to respond to. Lines 21–23 output a decimal 37 to the 8251 chip on the H8-2 board. This value causes the 8251 to do several things, the most important of which is to set the RTS line low to indicate to the ZX81 that the H8 is ready to receive a data word.

Once this has been done, lines 23–25 continually poll the 8251 status until the RXRDY line goes high to indicate that a data word has been received. When this happens, lines 26–27 transfer the word from the 8251 to the H8 processor and store it in memory. A decimal 16 is then sent to the 8251 to set the RTS line high and tell the ZX81 not to send another data word. Line 36 then returns to the Basic program.

> Remember that Heath software documentation uses octal rather than decimal or hexadecimal used by other manufacturers.

The machine-code routine is very general and will not change from application to application since all it does is "get" an eight-bit word from the ZX81. The Basic program that *uses* the data, however, will be tailored to a specific application. As an example, the program shown in Listing 2 interprets the data sent by the ZX81 as a program listing. Operation of this program is as follows:

Lines 1100–1310 set up the 256 special characters used by the ZX81. ZX81 Basic does not spell out keywords but instead stores them as single-word tokens. Thus, for example, GOSUB is stored as decimal 237 and the 237th entry in the translation table is GOSUB. The blank characters (commas with nothing between them) represent the ZX81 characters that have no equivalence in the ASCII character set used by Heath, such as the pound sign, the graphics characters, and so forth. You should look to reference 2 for a complete description of the ZX81 character set.

Lines 1320–1490 set up the machine-code routine just described. This is done by taking the octal values representing the routine and storing them in data statements. They are then read and poked into memory. Note that line 1040 sets up 1000 free bytes of memory to hold the user routine. More details on how to do this and interface a machine-code routine to Basic are contained in Appendix E and F of reference 3.

Basic has a quirk in that it expects a two-byte integer value as the argument of the DEF USR function, but won't allow a two-byte integer larger than 32767. This will restrict you to locating your USR routine low in memory, which won't leave much space for the Basic program. So lines 1430–1490 get around this by creating a two-byte integer larger than 32767.

Lines 1500–1590 initialize the 8251 chip on the H8-2 board. Again, reference 1 has more details on this.

Lines 1640–1820 take the data words from the ZX81 and interpret them as lines in a program listing. The first two words received, DW(1) and DW(2), are the line number of

Location	Contents	Machine Code	
16515	001	LD	BC,255
16516	000		
16517	255		
16518	219	IN	A,239
16519	239		
16520	230	AND	3
16521	003		
16522	254	CP	0
16523	000		
16524	202	JP	Z,16532
16525	148		
16526	064		
16527	005	DEC	B
16528	200	RET	Z
16529	195	JP	16518
16530	134		
16531	064		
16532	062	LD	A,(data)
16533	000		
16534	211	OUT	239,A
16535	239		
16536	201	RET	

Listing 6. Machine-code routine containing a loop counter.

```
1600 PRINT "=====> INITIALIZATION COMPLETE."
1610 PRINT "       READY FOR INPUT FROM ZX81."
1620 PRINT: PRINT
1630 PRINT TAB(10);"ZX81 STRING";
1640 PRINT TAB(40);"NUMERICAL VALUE"
1650 PRINT TAB(10);"-----------";
1660 PRINT TAB(40);"---------------"
1670 REM - GET A STRING OF CHARACTERS FROM THE ZX81
1680 NC=0
1690 NC=NC+1
1700 DW(NC)=USR(0)
1710 IF DW(NC)<>118 THEN 1690
1720 REM - FOUND 'ENTER', MUST BE END OF STRING
1730 S$=""
1740 FOR I=1 TO NC
1750 S$=S$+Z$(DW(I))
1760 NEXT I
1770 PRINT TAB(10);S$;
1780 PRINT TAB(40);VAL(S$)
1790 GOTO 1670
1800 END
OK
```

Listing 7. Modification for transmitting numerical data.

the statement. The remainder of the line is decoded by converting each word to its character equivalent using a few simple rules:

1. A number in a ZX81 Basic statement, such as GOTO 80, is represented by one eight-bit word for each digit in the number, followed by the value 126 to indicate the end of the number, followed by six other characters.

2. The end of a statement is signaled by the number 118, representing *enter*, which the ZX81 uses in place of a carriage return.

3. The ZX81 signals the end of the transmission by sending the value 111, followed by 118 (*enter*). Note that this is the way I set up the ZX81 program that transmits the data. You might want to come up with your own scheme for signing off. Why this sign-off is necessary will be described later.

When you run the program, you'll receive an output similar to that shown in Listing 3. What you get, of course, depends on what you've programmed the ZX81 to send.

Software for the Sinclair ZX81

As with the H8, the ZX81 requires both a Basic and a machine-code routine. The machine-code routine is shown in Listing 4. For more details on how the ZX81 handles a machine-code routine, you'll want to refer to a Z-80 programming manual such as that in reference 4.

This routine reads an eight-bit word from port 239. It checks bits 0 and 1 of this word to make sure that both are zero, indicating that the H8 is ready to receive a data word. Once this condition is satisfied, the data word is output to port 239 and the routine jumps back to Basic.

If you refer back to Listing 3, you'll see how this routine is put into memory and then called by Basic. First the routine has to be poked into memory; lines 20 through 60 do this. To use the routine, poke the data to be transmitted to the H8 into memory location 16525 and call the USR routine at location 16515. While a ZX81 USR routine can return data to the Basic program much like any other function does, this routine does not return any data, so you can use any variable (J in this case) as a dummy to call the USR routine.

You have a choice as to where to put a USR routine in the ZX81's memory:

1. *At the top of memory.* Reserve a block of memory by poking a smaller value into the ZX81's RAMTOP system variable. This technique will let you reserve space for a USR routine of any size; it's similar to the technique used on the H8 by the Clear statement on line 1040 of Listing 2.

2. *Buried somewhere in memory.* Be careful to put it where it won't get moved around or overwritten. Buried in a REM statement is a good place if the REM is the first program statement. This is the technique that I used.

The first statement in a ZX81 program is the only one that can't move around in memory—the program always starts at location 16509. Thus the first program line will be stored as shown in Table 3.

If you had a REM statement with 21 characters in it, then 21 memory locations would be available for the machine-code routine. Of course when you poke the machine-code routine into memory, you'll destroy what was there and the REM statement won't look the same when the program is listed after being run. For example, program line 10 in Listing 3 was typed in as:

```
10 REM 0123456789ABCDEFGHIJK
```

But after the program was run, the REM statement appeared as it is in the program listing. You can see that memory location 16515 was changed from 029 (representing 1) to 219. And the ZX81 represents the token 219 as the symbol =.

Another Example

Instead of a program listing, suppose you want to transfer numerical data from the ZX81 to the H8? The ZX81 program to do this is shown in Listing 5. The data isn't very sophisticated; the ZX81 simply inputs a number from the keyboard and transmits it to the H8. But that isn't important—this technique will work for numerical data regardless of the source. A couple of interesting points can be made about this example:

- Since the ZX81 transmits a single eight-bit word to the H8 at a time, the largest number that can be transferred as a single word is 255. To transmit a larger number or a fraction, the number must be "broken up" and transmitted as a series of digits. Convert the number to a string variable by using the STR$ function and then peel off the characters in the string to transmit them one at a time.

```
                ZX81 INTERFACE PROGRAM

→INITIALIZATION COMPLETE,
  READY FOR INPUT FROM ZX81.

ZX81 STRING                    NUMERICAL VALUE
1ENTER                         1
3.1415927ENTER                 3.1415927
123456790ENTER                 123456790
1753800000000ENTER             1753800000000
1.5E+15ENTER                   1500000000000000
1.5E+20ENTER                   1.5D+20
1.5E+30ENTER                   1.5D+30
1.5E+35ENTER                   1.5D+35
1E+38ENTER                     1D+38
0ENTER                         0
-3.1415927ENTER                -3.1415927
-1E+30ENTER                    -1D+30
```

Listing 8. Sample run.

Circuit Designation	VCC pin	GND pin	Description
U1	14	7	74LS04—hex inverter
U2	14	7	74LS02—quadruple two-input positive NOR gate
U3	14	7	74LS30—eight-input positive NAND gate
U4	20	10	74LS244—octal buffer/line driver/line receiver
U5	20	10	74LS373—octal D-type latch

Table 1. The five chips used in the ZX81/H8 interface.

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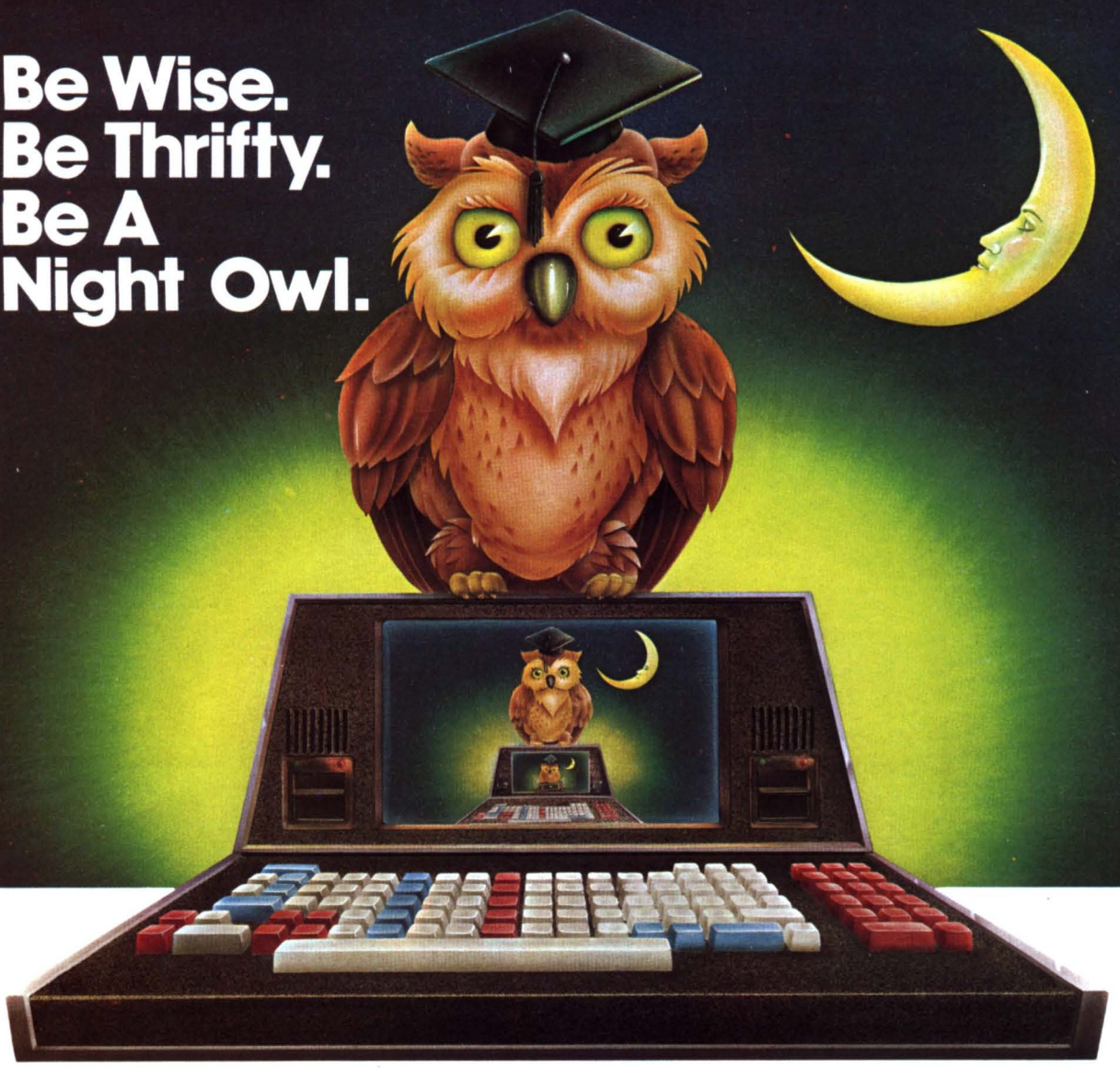

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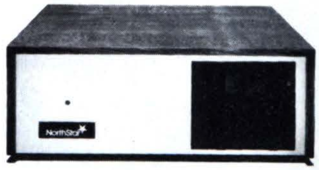

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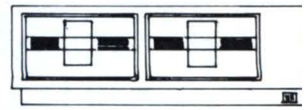

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Then at the receiving end the H8 reverses the process to regenerate the number. Enter, decimal 118, is transmitted at the end of the string to indicate the end of the number transmission.

●One of the problems with the ZX81 machine-code routine shown in the previous example, Listing 4, is that it can get into an endless loop if the H8 isn't ready to receive data. This can happen whenever one of the status lines ($\overline{RTS}$ or RXRDY) is always high, since this will cause the ZX81 to keep reading the status lines over and over again waiting for them to both go low. While the ZX81 is executing the machine-code routine like this, the keyboard has no effect, break will not stop the process, and you cannot get the ZX81 to jump out of the loop. You can, of course, pull the power plug, but then you lose everything.

●The machine-code routine used in this example, and shown in Listing 6, contains a loop counter that counts the number of times the routine reads the H8 status lines. If after 255 tries the status lines still indicate that the H8 isn't ready to read the data word, the routine gives up and returns to Basic. In the previous example, the USR routine did not return a value to Basic. But now it returns a numerical value related to the loop counter. If USR returns zero, then the loop counter counted from 255 down to zero and the data word was not transmitted to the H8. If the USR returns a value greater than zero, then the character was transmitted.

So in this example, the Basic program checks the value of the USR function and, if it is zero, calls the USR routine again to try another time to transmit the data. Ha, you say, if the H8 isn't ready to receive the data then we're still in an endless loop. Correct, I say, but in this case the loop jumps back and forth between Basic and the machine-code routine. And when you're in Basic you can regain control of things by pressing the break key. So we've found a way to control the endless loop problem.

The Basic program written for the H8 in the first example (see Listing 2) was designed to convert the ZX81 data to a program listing, so a few changes to that program are in order to transmit numerical data. The H8's Basic program is modified by replacing lines 1600 through 1850 with the lines shown in Listing 7. A sample run of this program is shown in Listing 8.

Where Do We Go from Here?

Now you're ready to try out your own application. One of the things you might want to consider is that, of the eight inputs to chip U4 in the interface circuit, we're only using two. Those two could be combined into one by using an OR gate. So you've got an unused six- or seven-bit parallel input port for the ZX81. That opens up many possibilities.■

$\overline{WR}$	This signal is generated by the ZX81. When it is low (0 volts) it indicates that the ZX81 has placed data on the data lines D0–D7.
$\overline{IORQ}$	Also generated by the ZX81, a low on this line means that the ZX81 is reading or writing data to/from an output device. When both this line and $\overline{WR}$ are low, the ZX81 is writing data to an output device whose address is contained on A0–A7.
$\overline{RTS}$	This signal is controlled by the H8's software. A low means that the H8's parallel interface board is ready to accept data from the ZX81.
RXRDY	This signal is controlled by the hardware on the H8's parallel interface board. A high (5 volts) on this line means that the parallel interface board has accepted a character from the ZX81 and is holding it for the H8 processor to read. If another character is sent before this line goes low, the first character will be overwritten and lost.
$\overline{DATA\ SENT}$	This signal is generated by the interface circuit. A low means that data from the ZX81 has been latched by the interface circuit and placed on the H8's input data lines D0–D7. The data will be present on the H8's data lines until a new character is sent by the ZX81 but DATA SENT will remain low only a short period of time.
$\overline{OUT}$	This signal is generated and used by the interface circuit. A low means that the ZX81 is executing an OUT instruction.
$\overline{IN}$	Similarly, a low on this line means that the ZX81 is executing an IN instruction.
$\overline{239}$	This line is low whenever 239 (decimal) appears on the ZX81 address lines A0–A7. This signal is generated and used by the interface circuit to tell whether an IN or OUT instruction refers to port 239 or some other device.
$\overline{OUT239}$	This line goes low whenever the ZX81 processor executes an OUT instruction to port 239.
$\overline{IN239}$	A low on this line occurs whenever the ZX81 processor is executing an IN instruction and is reading data from port 239.

Table 2. Signals used in the interface circuit.

Locations	Contents
16509–16510	line number of the statement
16511–16512	number of characters in the line
16513	the value 234 to indicate that what follows is a REM statement
16514–?????	the characters after the REM

Table 3. ZX81 program addresses.

References

1. *H8-2 Parallel I/O Interface Manual*, Heath Company, 1977, part number 595-2033-03. Not one of Heath's better manuals—contains a number of errors and omissions. But a *must* if you want to figure out how the H8-2 board works and use it with anything but the obsolete H-10 paper tape reader/punch.

2. *ZX81 Basic Programming*, first edition, Steven Vickers, Sinclair Research Limited, 1981. An incredible amount of information in a small package. After five or six readings I'm still finding gems. But uneven in its coverage of the ZX81. You might want to supplement it with back issues of ZX81 newsletters.

3. *Microsoft Basic Software Reference Manual*, Heath Company, 1979/1980, part number 595-2285-01. Everything you've come to expect and love in a Heath manual—at least at the highest level. Little information about how the Basic interpreter works (guess that shouldn't surprise anyone) except for the two appendices describing the USR routines. Cumbersome use of USR makes this function appear to be a last-minute tack-on.

4. *Programming the Z-80*, third edition, Rodney Zaks, SYBEX Publishing, 1980. If you're not an expert in Z-80 programming, you'll need this—or one of its many look-alikes.

CONVERSIONS

The following are Atari, Heath, IBM PC and CBM/PET translations of the Micro Money-Maker program published in the September 1982 issue of *Microcomputing*.

```
10 PRINT CHR$(125);:REM CLEAR SCREEN
20 REM ************************************************************
30 REM *                                                          *
40 REM *      THIS PROGRAM CALCULATES THE FUTURE FALUE OF CASH FLOWS      *
50 REM *                                                          *
60 REM *      WRITTEN BY ... JOE NAJJAR III                       *
65 REM *                                                          *
70 REM *      TRANSLATED TO ATARI BASIC BY PHILIP M. KREIKER      *
75 REM *                                                          *
80 REM *                                                          *
85 REM ************************************************************
90 REM
100 REM ***********************************************************
110 REM *                                                          *
120 REM *     INITIALIZE PROGRAM TO ACCEPT 100 DIFFERENT CASH FLOW AMOUNTS  *
130 REM *                                                          *
140 REM *     CF(X)=CASH FLOW AMOUNT NUMBER X                      *
150 REM *                                                          *
160 REM *     N(X)=NUMBER OF CONSECUTIVE REPETITIONS OF CASH FLOW NUMBER X  *
170 REM *                                                          *
180 REM ***********************************************************
190 C=1:ROW=3:P=1
200 DIM CF(100),N(100),A$(16)
210 REM ***********************************************************
220 REM *                                                          *
230 REM *     REQUEST INPUTS FOR CASH FLOW AND CONSECUTIVE PERIODS      *
240 REM *                                                          *
250 REM ***********************************************************
260 POSITION 2,0:PRINT "PERIOD        CASH FLOW     CONSECUTIVE";
270 PRINT "NUMBER          AMOUNT        CASH FLOWS"
280 POSITION 5,ROW:PRINT P
285 POSITION 15,ROW
290 INPUT A$
310 IF A$="END" AND C<>1 THEN 470
315 IF A$="END" THEN END
320 TRAP 285:CF(C)=VAL(A$):TRAP 32768
330 POSITION 28,ROW
340 NC=1
345 INPUT A$:IF LEN(A$)=0 THEN 360
350 TRAP 330:NC=VAL(A$):TRAP 32768
355 IF NC<>INT(NC) OR NC<=0 THEN 330
360 N(C)=NC
370 FOR X=1 TO NC
375 IF X=1 THEN 400
380 POSITION 5,ROW:PRINT P
390 POSITION 16,ROW:PRINT CF(C)
400 P=P+1
410 IF ROW=22 THEN POSITION 2,3:PRINT CHR$(156):REM SCROLL UP
420 IF ROW<22 THEN ROW=ROW+1
440 NEXT X
450 C=C+1
460 GOTO 280
470 C=C-1
480 REM ***********************************************************
490 REM *                                                          *
500 REM *     REQUEST INTEREST RATE ASSUMPTION AND SOTRE IT IN VARIABLE II  *
510 REM *                                                          *
520 REM ***********************************************************
530 TRAP 530:PRINT
532 PRINT "WHAT IS THE ASSUMED INTEREST RATE PER PERIOD (IN %)";:INPUT II
534 TRAP 32768
540 IF II<=0 THEN 530
550 II=II/100
560 REM ***********************************************************
570 REM *                                                          *
580 REM *     CALCULATE THE FUTURE VALUE                           *
590 REM *                                                          *
600 REM ***********************************************************
605 POKE 752,1:PRINT :REM TURN CURSOR OFF
610 NN=0:III=1+II:TT=1:REM TT=(1+II)^T
620 FOR X=C TO 1 STEP -1
630 FOR Y=1 TO N(X)
640 NN=NN-CF(X)*TT
650 TT=TT*III
660 NEXT Y:NEXT X
670 FV=INT(NN+0.5)
680 REM ***********************************************************
690 REM *                                                          *
700 REM *     VIDEO DISPLAY OF RESULT                              *
710 REM *                                                          *
720 REM ***********************************************************
725 POKE 752,0:REM TURN CURSOR ON
730 PRINT CHR$(125):PRINT :PRINT "THE FUTURE VALUE IS $";FV
740 REM ***********************************************************
750 REM *                                                          *
760 REM *     ASK IF HARD COPY IS DESIRED                          *
770 REM *                                                          *
780 REM ***********************************************************
800 PRINT :PRINT "DO YOU WANT A HARD COPY PRINT OUT      (Y OR N)";:INPUT A$
810 IF A$="Y" THEN GOSUB 1010
820 IF A$<>"N" THEN 800
840 REM ***********************************************************
850 REM *                                                          *
860 REM *     ASK FOR NEW INTEREST RATE ASSUMPTION AND RECALCULATE      *
870 REM *                                                          *
880 REM ***********************************************************
890 PRINT
892 PRINT "DO YOU WANT TO RECALCULATE AT A        DIFFERENT INTEREST RATE";
895 INPUT A$
900 IF A$="Y" THEN 530
910 IF A$<>"N" THEN 890
920 REM ***********************************************************
930 REM *                                                          *
940 REM *     ASK IF COMPLETE PROGRAM RERUN IS DESIRED             *
950 REM *                                                          *
960 REM ***********************************************************
980 PRINT :PRINT "DO YOU WANT TO RUN AGAIN FROM SCRATCH (Y OR N)";:INPUT A$
990 IF A$="Y" THEN RUN
1000 IF A$<>"N" THEN 980
1005 END
1010 A$="N"
1020 REM ***********************************************************
1030 REM *                                                          *
1040 REM *    HARD COPY PRINT OUT SUBROUTINE                        *
1050 REM *                                                          *
1060 REM ***********************************************************
1070 FOR X=1 TO 5:LPRINT :NEXT X
1080 LPRINT "FUTURE VALUE SUMMARY":LPRINT
1090 LPRINT "ASSUMED INTEREST RATE PER PERIOD ";II*100;"%":LPRINT
1100 LPRINT "CASH FLOW DETAIL":LPRINT
1110 LPRINT "PERIOD",,"CASH FLOW",,"NO. OF CONSECUTIVE"
1120 LPRINT "NUMBER",,," AMOUNT  ","SIMILAR CASH FLOWS"
```

More

Listing continued.

```
1130 LPRINT
1140 P=1:FOR X=1 TO C
1150 LPRINT " ";P,," ";CF(X),,"          ";N(X)
1160 P=P+N(X):NEXT X
1170 LPRINT :LPRINT :LPRINT
1180 LPRINT "FUTURE VALUE = $";FV:RETURN
```

Philip Kreiker's (PO Box 5084, Loveland, CO 80537) conversion of the Micro Money-Maker program for the Atari.

```
1000 '*************************************************************
1010 '*                                                           *
1020 '*   THIS PROGRAM CALCULATES THE FUTURE VALUE OF CASH FLOWS  *
1030 '*                                                           *
1040 '*   WRITTEN BY JOE NAJJAR III                               *
1050 '*                                                           *
1060 '*   MODIFIED FOR HEATH HDOS/MBASIC BY A. STUMPF             *
1070 '*                                                           *
1080 '*************************************************************
1090 '
1100 '*************************************************************
1110 '*                                                           *
1120 '*   INITIALIZE PROGRAM TO ACCEPT 100 DIFFERENT CASH FLOW AMOUNTS  *
1130 '*                                                           *
1140 '*   CF(X)=CASH FLOW AMOUNT NUMBER X                         *
1150 '*                                                           *
1160 '*   N(X)=NUMBER OF CONSECUTIVE REPETITIONS OF CASH FLOW NUMBER X  *
1170 '*                                                           *
1180 '*************************************************************
1190 '
1200 E$=CHR$(27): E1$=E$+"E": U$=E$+"A": DIM CF(100),N(100)
1210 ON ERROR GOTO 2290
1220 '
1230 '*************************************************************
1240 '*                                                           *
1250 '*   REQUEST INPUTS FOR CASH FLOW AND CONSECUTIVE REPETITIONS  *
1260 '*                                                           *
1270 '*************************************************************
1280 '
1290 C=1:P=1: PRINT E1$: PRINT: PRINT
1300 PRINT "PERIOD          CASH FLOW          NO OF CONSECUTIVE"
1310 PRINT "NUMBER            AMOUNT           SIMILAR CASH FLOWS"
1320 PRINT STRING$(53,95): PRINT
1330 PRINT P;TAB(18);
1340 A$="": LINEINPUT "";A$
1350 IF A$="END" AND C<>1 THEN C=C-1: GOTO 1500
1360 CF(C)=VAL(A$): IF CF(C)=0 AND A$<>"0" THEN 1330
1370 PRINT TAB(42);U$;: N(C)=1
1380 LINEINPUT "";A$: N(C)=VAL(A$)
1390 IF N(C)<>INT(N(C)) OR N(C)<=0 THEN 1500
1400 IF N(C)>1 THEN GOSUB 1420
1410 C=C+1: P=P+1: GOTO 1330
1420 FOR X=2 TO N(C): P=P+1: PRINT P;TAB(17);CF(C): NEXT: RETURN
1430 '
1440 '*************************************************************
1450 '*                                                           *
1460 '*   REQUEST INTEREST RATE ASSUMPTION AND STORE IN VARIABLE II  *
1470 '*                                                           *
1480 '*************************************************************
1490 '
1500 A$="": PRINT: PRINT
1510 LINEINPUT "WHAT IS THE ASSUMED INTEREST RATE PER PERIOD (IN %): ";A$
1520 II=VAL(A$): IF II=0 THEN 1500
1530 II=II/100
1540 '
1550 '*************************************************************
1560 '*                                                           *
1570 '*   CALCULATE THE FUTURE VALUE                              *
1580 '*                                                           *
1590 '*************************************************************
1600 '
1610 NN=0: T=0
1620 FOR X=C TO 1 STEP -1: FOR Y=1 TO N(X)
1630 NN=NN-CF(X)*(1+II)^T: T=T+1
1640 NEXT Y: NEXT X: FV=NN
1650 PRINT: PRINT "   FUTURE VALUE =";FV
1660 '
1670 '*************************************************************
1680 '*                                                           *
1690 '*   ASK IF HARD COPY IS DESIRED                             *
1700 '*                                                           *
1710 '*************************************************************
1720 '
1730 A$="": PRINT
1740 LINEINPUT "DO YOU WANT A HARD COPY PRINT OUT (Y OR N): ";A$
1750 IF A$="Y" THEN GOSUB 2070: GOTO 1840
1760 IF A$<>"N" THEN 1730
1770 '
1780 '*************************************************************
1790 '*                                                           *
1800 '*   ASK FOR NEW INTEREST RATE ASSUMPTION AND RECALCULATE    *
1810 '*                                                           *
1820 '*************************************************************
1830 '
1840 A$="": PRINT
1850 PRINT "DO YOU WANT TO RECALCULATE AT A DIFFERENT ";
1860 PRINT "INTEREST RATE (Y OR N): ";: LINEINPUT "";A$
1870 IF A$="Y" THEN 1500
1880 IF A$<>"N" THEN 1840
1890 '
1900 '*************************************************************
1910 '*                                                           *
1920 '*   ASK IF COMPLETE PROGRAM RERUN IS DESIRED                *
1930 '*                                                           *
1940 '*************************************************************
1950 '
1960 A$="": PRINT
1970 LINE INPUT "DO YOU WANT TO RUN AGAIN FROM SCRATCH (Y OR N): ";A$
1980 IF A$="Y" THEN 1290
1990 IF A$="N" THEN END ELSE 1960
2000 '
2010 '*************************************************************
2020 '*                                                           *
2030 '*   HARD COPY PRINT OUT ROUTINE                             *
2040 '*                                                           *
2050 '*************************************************************
2060 '
2070 OPEN "O",#1,"LP:"
2080 FOR I=1 TO 5: PRINT #1," ": NEXT
2090 PRINT #1,TAB(5);"FUTURE VALUE SUMMARY": PRINT #1," "
```

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Listing continued.

```
2100 PRINT #1,TAB(5);"ASSUMED INTEREST RATE PER PERIOD =";II*100;"%"
2110 PRINT #1," ": PRINT #1," "
2120 PRINT #1,TAB(5);TAB(20);"CASH FLOW DETAIL": PRINT #1," "
2130 PRINT #1,TAB(5);"PERIOD      CASH FLOW      NO OF CONSECUTIVE"
2140 PRINT #1,TAB(5);"NUMBER        AMOUNT       SIMILAR CASH FLOWS"
2150 PRINT #1,TAB(5);STRING$(43,95): PRINT #1," "
2160 PRINT #1," ": P=1: FOR X=1 TO C
2170 PRINT #1,TAB(7);P;TAB(17);CF(X);TAB(35);N(X)
2180 P=P+N(X): NEXT X
2190 PRINT #1," ": PRINT #1," "
2200 PRINT #1,TAB(5);"FUTURE VALUE =";FV
2210 CLOSE #1: RETURN
2220 '
2230 '*************************************************************************
2240 '*                                                                       *
2250 '*   ERROR HANDLER                                                       *
2260 '*                                                                       *
2270 '*************************************************************************
2280 '
2290 IF ERR=57 AND ERL=2070 THEN 2310
2300 ON ERROR GOTO 0
2310 A$="": PRINT: PRINT "HARD COPY DEVICE DRIVER IS NOT LOADED"
2320 LINEINPUT "RETURN TO HDOS (Y OR N): ";A$
2330 IF A$="Y" THEN SYSTEM
2340 IF A$<>"N" THEN 2310 ELSE RESUME 1290
```

Micro Money-Maker program modified to run on the Heath/Zenith system. By Adolph Stumpf, 411 E. Palm St., Litchfield Park, AZ 85340.

```
10 CLS
20 '*************************************************************************
30 '*                                                                       *
40 '*    This Program calculates the Future Value of Cash Flows             *
50 '*                                                                       *
55 '*    Written by ... Joe Najjar III for Microcomputing Sept 1982         *
60 '*                                                                       *
65 '*    Adapted for the IBM PC by Bruce C. Lutz                            *
70 '*                                                                       *
80 '*************************************************************************
90 '
100 '************************************************************************
110 '*                                                                      *
120 '*    Initialize program to accept 100 different Cash Flow amounts      *
130 '*                                                                      *
140 '*    CF(X)=Cash Flow amount number X                                   *
150 '*                                                                      *
160 '*    N(X)= Number of consecutive repetitions of Cash Flow number X     *
170 '*                                                                      *
180 '************************************************************************
190 C=1:LIN = 3:P=1
200 DIM CF(100), N(100)
210 '************************************************************************
220 '*                                                                      *
230 '*    Request Inputs for Cash Flow and Consecutive Periods              *
240 '*                                                                      *
250 '************************************************************************
260 LOCATE 1:PRINT "PERIOD                    CASH FLOW                    NO. OF
CONSECUTIVE"
270 PRINT "NUMBER                    AMOUNT                    SIMILAR CASH FLO
WS"
280 LOCATE LIN:PRINT P:LOCATE LIN,23
290 A$=""
300 INPUT A$
310 IF A$="END" AND C<>1 THEN 470
315 IF A$="" THEN 280
320 CF(C)=VAL(A$):IF CF(C)=0 AND A$<>"0" THEN 380
330 LOCATE LIN,52
340 N(C)=1
350 INPUT N(C):IF N(C)<>INT(N(C)) OR N(C)<=0 THEN LOCATE LIN,52:PRINT "
  ":GOTO 330
360 IF N(C)>1 THEN GOSUB 410
370 C=C+1:P=P+1
380 IF LIN<23 THEN LIN=LIN+1
390 PRINT
400 GOTO 260
410 FOR X=2 TO N(C)
420 P=P+1
430 IF LIN<23 THEN LIN=LIN + 1
450 LOCATE LIN,24:PRINT CF(C)
460 NEXT X:RETURN
470 C=C-1
480 '************************************************************************
490 '*                                                                      *
500 '*    Request Interest rate assumption and store in variable II         *
510 '*                                                                      *
520 '************************************************************************
530 INPUT "WHAT IS THE ASSUMED INTEREST RATE PER PERIOD (IN %) ";II
540 IF II=0 THEN 530
550 II=II/100
560 '************************************************************************
570 '*                                                                      *
580 '*    Calculate the Future Value                                        *
590 '*                                                                      *
600 '************************************************************************
610 NN=0: T=0
620 FOR X=C TO 1 STEP -1
630 FOR Y=1 TO N(X)
640 NN=NN-CF(X)*(1+II)^T
650 T=T+1
660 NEXT Y:NEXT X
670 FV=NN
680 '************************************************************************
690 '*                                                                      *
700 '*    Video Display of Result                                           *
710 '*                                                                      *
720 '************************************************************************
730 CLS:PRINT :PRINT "THE FUTURE VALUE IS --- ";FV
740 '************************************************************************
750 '*                                                                      *
760 '*    Ask if Hard Copy is desired                                       *
770 '*                                                                      *
780 '************************************************************************
790 A$=""
800 PRINT :INPUT "DO YOU WANT A HARD COPY PRINT OUT (Y OR N) ";A$
810 IF A$="Y" OR A$="y" THEN GOSUB 1010
820 IF A$<>"N" AND A$<>"n" THEN 800
830 A$=""
840 '************************************************************************
850 '*                                                                      *
860 '*    Ask for NEW Interest Rate assumption and Recalculate              *
870 '*                                                                      *
880 '************************************************************************
890 INPUT "DO YOU WANT TO RECALCULATE AT A DIFFERENT INTEREST RATE ";A$
900 IF A$="Y" OR A$="y" THEN 530
910 IF A$<>"N" AND A$<>"n" THEN 890
920 '************************************************************************
930 '*                                                                      *
940 '*    Ask if complete program rerun is desired                          *
```

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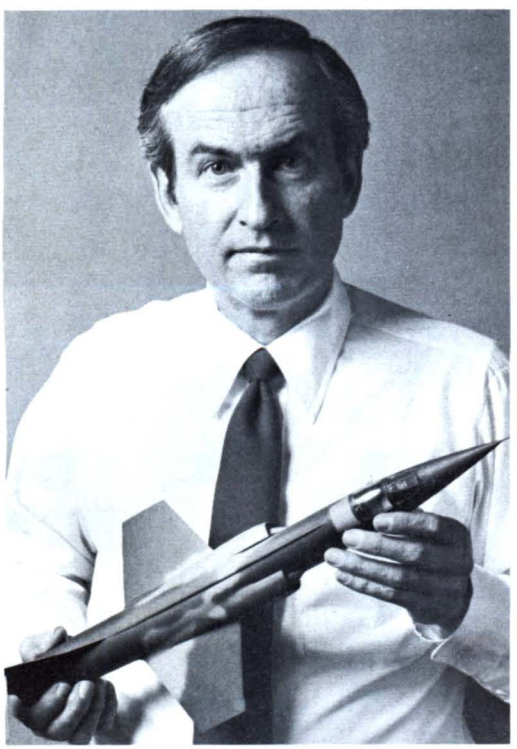

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Listing continued.

```
950 '*                                                                    *
960 '**********************************************************************
970 A$=""
980 INPUT "DO YOU WANT TO RUN AGAIN FROM SCRATCH (Y OR N) ";A$
990 IF A$="Y" OR A$="y" THEN RUN
1000 IF A$<>"N" OR A$<>"n" THEN END ELSE 980
1010 A$="N"
1020 '**********************************************************************
1030 '*                                                                    *
1040 '*     Hard Copy print out routine                                    *
1050 '*                                                                    *
1060 '**********************************************************************
1070 FOR X=1 TO 5:LPRINT " ":NEXT X
1080 LPRINT "FUTURE VALUE SUMMARY":LPRINT " "
1090 LPRINT "ASSUMED INTEREST RATE PER PERIOD";II*100;"%":LPRINT " "
1100 LPRINT "CASH FLOW DETAIL":LPRINT " "

1110 LPRINT "PERIOD                    CASH FLOW                    NO. OF CONSECU
TIVE"

1120 LPRINT "NUMBER                    AMOUNT                       SIMILAR CASH F
LOWS"
1130 LPRINT " "
1140 P=1:FOR X=1 TO C
1150 LPRINT "  "iP TAB(27) CF(X) TAB(62) N(X)
1160 P=P+N(X):NEXT X
1170 LPRINT :LPRINT
1180 LPRINT "FUTURE VALUE = $";FV:RETURN
```

Micro Money-Maker translation for the IBM PC by Bruce Lutz (404 Arborcrest Drive, Richardson, TX 75080).

```
  10 REM ******************************
  20 REM  THIS PROGRAM CALCULATES THE
  30 REM  FUTURE VALUE OF CASH FLOWS
  40 REM
  50 REM  WRITTEN BY: JOE NAJJAR III
  60 REM
  70 REM  CONVERTED BY: AL KOROSTYNSKI
  80 REM ******************************
  90 :
 100 REM ******************************
 110 REM  INITIALIZE PROGRAM TO ACCEPT
 120 REM  100 DIFFERENT CASH FLOW
 130 REM  AMOUNTS
 140 REM
 150 REM  CF(X)=CASH FLOW AMOUNT
 160 REM  NUMBER X
 170 REM
 180 REM  N(X)=NUMBER OF CONSECUTIVE
 190 REM  REPETITIONS OF CASH FLOW
 200 REM  NUMBER X
 210 REM ******************************
```

More

Listing continued.

```
220 :
230 C=1: P=1
240 DIM CF(100),N(100)
250 :
260 REM ******************************
270 REM  REQUEST INPUTS FOR CASH FLOW
280 REM  AND CONSECTUTIVE PERIODS
290 REM ******************************
300 :
310 PRINT "[CLEAR]PERIOD   CASH FLOW   NO. OF CONSECUTIVE"
320 PRINT "NUMBER    AMOUNT     SIMILAR CASH FLOWS"
330 PRINT P;TAB(9);: INPUT "  .[03 LEFT]";A$
340 IF A$="END" AND C()1 THEN C=C-1: GOTO 510
350 CF(C)=VAL(A$): IF CF(C)=0 AND A$()"0" THEN 330
360 PRINT TAB(27);"[UP]";
370 INPUT "  .[03 LEFT]";A$: N(C)=VAL(A$): IF A$="." THEN N(C)=1
380 IF N(C)()INT(N(C)) OR N(C)(=0 THEN 330
390 IF N(C)=1 THEN 430
400 FOR X=2 TO N(C): REM  DISPLAY CONSECUTIVE CASH FLOWS
410 P=P+1: PRINT P;TAB(10);CF(C)
420 NEXT X
430 C=C+1: P=P+1
440 GOTO 330
450 :
460 REM ******************************
470 REM  GET INTEREST RATE ASSUMPTION
480 REM  & STORE IN VARIABLE II
490 REM ******************************
500 :
510 PRINT "[DOWN]WHAT IS THE ASSUMED INTEREST RATE"
520 INPUT "PER PERIOD (IN %)  .[03 LEFT]";A$
530 II=VAL(A$): IF II=0 THEN 510
540 II=II/100
550 :
560 REM ******************************
570 REM  CALCULATE THE FUTURE VALUE
580 REM ******************************
590 :
600 NN=0: T=0
610 FOR X=C TO 1 STEP -1
620 FOR Y=1 TO N(X)
630 NN=NN-CF(X)*(1+II)^T
640 T=T+1
650 NEXT Y: NEXT X
660 FV=INT(NN+.5)
670 :
680 REM ******************************
690 REM  DISPLAY FUTURE VALUE
700 REM ******************************
710 :
720 PRINT "[CLEAR][DOWN]THE FUTURE VALUE IS ----  ";FV
730 :
740 REM ******************************
750 REM  PRINT A HARD COPY ?
760 REM ******************************
770 :
780 PRINT "[DOWN]DO YOU WANT A HARD COPY PRINT OUT"
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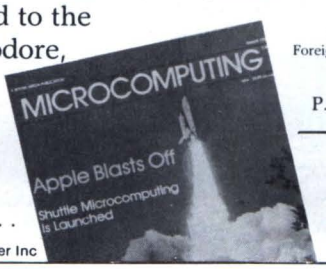

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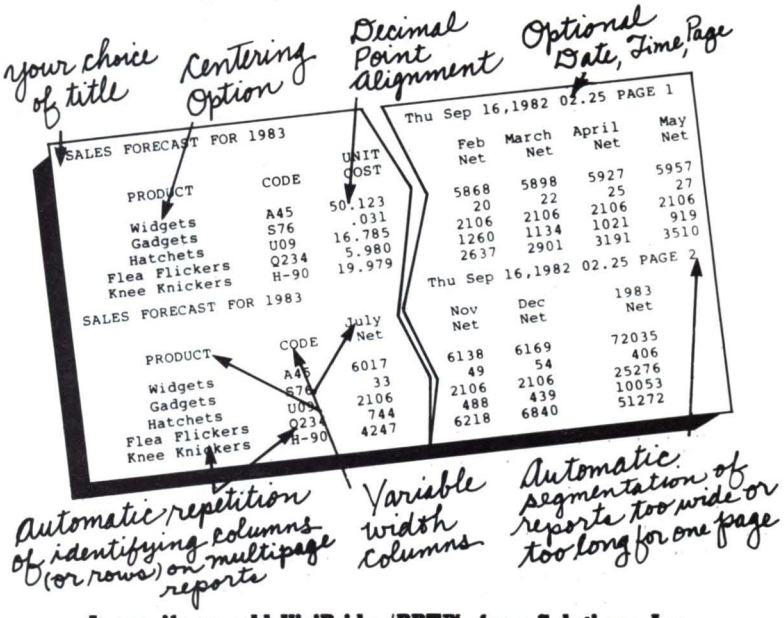

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Listing continued.

```
790 INPUT "(Y OR N)  .[03 LEFT]";A$
800 IF A$="N" THEN 1080
810 IF A$()"Y" THEN 780
820 :
830 REM ******************************
840 REM  HARD COPY PRINT OUT ROUTINE
850 REM ******************************
860 :
870 OPEN 4,4
880 FOR X=1 TO 5: PRINT#4: NEXT X
890 PRINT#4,"FUTURE VALUE SUMMARY": PRINT#4
900 PRINT#4,"ASSUMED INTEREST RATE PER PERIOD:";II*100;"%"
910 PRINT#4: PRINT#4
920 PRINT#4,"CASH FLOW DETAIL": PRINT#4
930 PRINT#4,"PERIOD    CASH FLOW    NO. OF CONSECUTIVE"
940 PRINT#4,"NUMBER      AMOUNT      SIMILAR CASH FLOWS"
950 PRINT#4
960 P=1: FOR X=1 TO C
970 PRINT#4,SPC(1)RIGHT$("    "+STR$(P),3);: REM  3 SPACES
980 PRINT#4,SPC(3)RIGHT$("           "+STR$(CF(X)),10);: REM  10 SPACES
990 PRINT#4,SPC(11)RIGHT$("    "+STR$(N(X)),3): REM  3 SPACES
1000 P=P+N(X): NEXT X
1010 PRINT#4: PRINT#4
1020 PRINT#4,"FUTURE VALUE = $";FV
1030 CLOSE4
1040 :
1050 REM ******************************
1060 REM  NEW INTEREST RATE & CALC ?
1070 REM ******************************
1080 :
1090 PRINT "[DOWN]DO YOU WANT TO RECALCULATE AT A"
1100 INPUT "DIFFERENT INTEREST RATE (Y OR N)  .[03 LEFT]";A$
1110 IF A$="Y" THEN 510
1120 IF A$()"N" THEN 1090
1130 :
1140 REM ******************************
1150 REM  RUN AGAIN ?
1160 REM ******************************
1170 :
1180 PRINT "[DOWN]DO YOU WISH TO RUN AGAIN FROM SCRATCH"
1190 INPUT "(Y OR N)  .[03 LEFT]";A$
1200 IF A$="Y" THEN RUN
1210 IF A$()"N" THEN 1180
```

Conversion of the Micro Money-Maker that runs on any CBM/PET computer. By Al Korostynski, PO Box 100, Westfield, MA 01086.

Christopher Lindell (706 10th Avenue, PO Box 5360, Coralville, IA 52241) translated the "Black Friday" program (September *Microcomputing*, p. 88) for the IBM Personal Computer. His adaptation follows.

```
100 REM ******* IBM PC BLACK FRIDAY ***********
110 REM
120 REM ..... L.C.SYSTEMS - CHRIS LINDELL .....
130 REM
140 REM  P.O. BOX 5360 * CORALVILLE, IOWA 52241
150 REM
160 REM ****************************************
170 REM
190 CLS:KEY OFF:LOCATE 12,18:PRINT "%%% BLACK FRIDAY STOCK MARKET GAME %%%"
200 DIM A(36,10),U(11,9),E(11,9),M(4,12),I(10),T(10),F(10)
220 S$="*HIBXP SP ODMRD SO BT KA ZE BPL*"
230 LOCATE 14,18:PRINT "       *** INITIALIZING DATA ***"
235 RANDOMIZE VAL(RIGHT$(TIME$,2))
240 FOR X = 1 TO 10:READ N:NEXT X
250 FOR N = 1 TO 36:FOR J=1 TO 9:READ X
260 A(N,J)=X:NEXT J:NEXT N
290 FOR R = 1 TO 2:FOR N=1 TO 11:FOR J = 1 TO 9:READ X
300 IF R = 1 THEN U(N,J) =X
310 IF R = 2 THEN E(N,J) =X
320 NEXT J:NEXT N:NEXT R
325 REM ======STOCK YIELDS (DIVIDENDS)
330 DATA 5,1,0,4,7,0,0,2,6,3
340 RESTORE : FOR N=1 TO 10:READ X:I(N) = X:F(N)=0:T(N) =100:NEXT N
350 FOR N = 1 TO 4:FOR J = 2 TO 12:M(N,J)=0:NEXT J:M(N,1)=5000:NEXT N
360 FOR N = 1 TO 36:A(N,10)=0:NEXT N:Y=0
370 CLS:LOCATE 12,16:PRINT "NUMBER OF PLAYERS (1 TO 4) ";
380 R$=INKEY$:IF R$ = "" GOTO 380
381 P=VAL(R$):IF P>4 OR P< 1 THEN 370 ELSE CLS:GOSUB 1000
382 REM ========================
384 REM     COMPUTE PRICES
386 REM ========================
390 LOCATE 20,1:PRINT "     *** COMPUTING NEXT YEAR ***          "
391 FOR L1 = 3 TO 13:LOCATE L1,44:PRINT SPC(35);:NEXT L1
395 W1 =0:D = INT(11*RND+1)
400 C = INT(36*RND+1)
410 IF A(C,10) = 1 THEN 400
415 A(C,10)=1
450 FOR N =2 TO 10:IF INT(C/2) <> INT((C-1)/2) THEN 470
460 R$="BULL":F(N)=A(C,N-1)+U(D,N-1):GOTO 480
470 R$="BEAR":F(N)=A(C,N-1)+E(D,N-1)
472 REM ========================
474 REM    CHECK STOCK SPLITS
476 REM ========================
480 T(N)=T(N) + F(N):IF T(N) < 150 THEN 530
490 Z = 3*(N-1)+2:LOCATE N+3,47:PRINT "*** "MID$(S$,Z,3);"  STOCK SPLIT ***";
500 J = INT(T(N)/2):IF T(N)/2 THEN T(N) = J: GOTO 520
510 T(N)= J+1
520 FOR J = 1 TO P:M(J,N+1)=M(J,N+1)*2:NEXT J
522 REM ========================
525 REM    CHECK BANKRUPTCIES
527 REM ========================
530 IF T(N)>0 THEN 570
540 T(N)= 100:FOR J=1 TO P:M(J,N+1)=0:NEXT J
560 Z=3*(N-1)+2:LOCATE N+3,47:PRINT "*** "MID$(S$,Z,3);" WENT BANKRUPT ***";
570 NEXT N
572 REM ========================
574 REM     UPDATE DISPLAY
576 REM ========================
580 FOR N = 1 TO P:M(N,12)=0
590 FOR J = 1 TO 10:IF T(J) >=50 THEN M(N,12)=M(N,12)+(I(J)*M(N,J+1))
600 NEXT J:M(N,1)=M(N,1)+M(N,12):NEXT N:Y = Y+1
620 LOCATE 1,1:PRINT "%%%  YEAR  "Y"      %%%%  "LEFT$(R$,4)" MARKET  %%%%"
621 LOCATE 1,49:PRINT "  %%%% MESSAGES %%%% "
```

More

Listing continued.

```
630 IF Y <> 11 THEN 640
635 LOCATE 2,49:COLOR 0,7:PRINT " * * * CLOSING * * * ":COLOR 7,0
636 LOCATE 20,1:PRINT SPC(39)
640 LOCATE 2,1:PRINT "     +/-    NEW      ----PLAYER HOLDINGS----"
650 LOCATE 3,1:PRINT "STK  CHNG  COST   .1..   .2..   .3..   .4.."
660 FOR X = 1 TO 10:GOSUB 950:NEXT X:LOCATE 14,1:PRINT "DIV'S THIS YR   ";
665 R$ = "      "
670 FOR J = 1 TO P:Z=5-LEN(STR$(M(J,12))):PRINT " ";M(J,12);
673 IF Z >= 1 THEN PRINT LEFT$(R$,Z);
676 NEXT J : GOSUB 980
680 IF Y =11 THEN 1020
682 REM ======================
684 REM  PLAYER TRANSACTIONS
686 REM ======================
690 FOR N = 1 TO P
700 LOCATE 23,1:PRINT SPC(39)
712 LOCATE 20,1:PRINT SPC(39):CHR$(13);SPC(39);CHR$(13);SPC(39)
714 LOCATE 20,1:PRINT "PLAYER #";N;" (B=BUY,S=SELL,D=DONE) ";
715 INPUT;R$ :IF LEFT$(R$,1)="D" OR LEFT$(R$,1) ="d" THEN 870
720 IF LEFT$(R$,1)="s" OR LEFT$(R$,1) ="S" THEN 780
730 IF LEFT$(R$,1)<>"b" AND LEFT$(R$,1) <>"B" THEN 700
735 REM --- BUY SHARES ---
740 GOSUB 900:LOCATE 22,11:PRINT "NUMBER OF SHARES BUYING ";
750 INPUT R$:R = VAL(R$):LOCATE 23,1:IF R < 1 THEN BEEP:COLOR 0,7:PRINT " ====>
BAD INPUT! ":COLOR 7,0:GOTO 712
760 IF R*T(X)>M(N,1) THEN LOCATE 23,1:COLOR 0,7:BEEP:PRINT " NOT ENOUGH MONEY! "
:COLOR 7,0:GOTO 712
770 M(N,X+1)=M(N,X+1)+R:M(N,1)=M(N,1)-(R*T(X)):GOTO 850
775 REM --- SELL SHARES ---
780 GOSUB 900:LOCATE 22,11:PRINT "NUMBER OF SHARES SELLING ";
790 INPUT R$:R = VAL(R$):LOCATE 23,1:IF R< 1 THEN BEEP:COLOR 0,7:PRINT " ====> B
AD INPUT! ":COLOR 7,0:GOTO 712
800 IF R <=M(N,X+1) THEN M(N,X+1)=M(N,X+1)-R:M(N,1)=M(N,1)+(R*T(X)):GOTO 850
810 BEEP:LOCATE 23,1:COLOR 0,7:PRINT " NOT ENOUGH SHARES! ":COLOR 7,0:GOTO 712
850 PRINT MID$(D$,2,4);:FOR J = 1 TO X:PRINT CHR$(29);:NEXT J:GOSUB 950
860 FOR J = 1 TO (12-X):PRINT CHR$(29);:NEXT J:GOSUB 980:GOTO 700
870 NEXT N:GOTO 390
872 REM ======================
874 REM * * * SUBROUTINES * * *
877 REM ======================
900 LOCATE 21,16:PRINT "STOCK ABBREVIATION ";:INPUT ;R$:IF LEN(R$)=3 THEN 910
903 IF LEN(R$) <> 2 THEN 940
906 R$ = R$ + " "
910 W1=0:FOR J = 0 TO 9:X=J+1
920 IF LEFT$(R$,3) = MID$(S$,(J*3)+2,3) THEN W1=1:J=9
930 NEXT J:IF W1=1 THEN RETURN
940 LOCATE 21,1:PRINT SPC(39):GOTO 900
950 LOCATE X+3,1:Z=3*(X-1)+2:PRINT MID$(S$,Z,3);"  ";F(X);
960 Z = 5 - LEN(STR$(F(X)))
965 R$="     ":PRINT MID$(R$,1,Z);T(X);
967 Z = 4-LEN(STR$(T(X))):PRINT MID$(R$,1,Z);
970 FOR J = 1 TO P:Z = 5-LEN(STR$(M(J,X+1))):PRINT " ";M(J,X+1);
973 IF Z >= 1 THEN PRINT MID$(R$,1,Z);
976 NEXT J: RETURN
980 LOCATE 16,1:PRINT "CASH TOTAL =    ";
985 R$="      "
990 FOR J = 1 TO P:Z = 5-LEN(STR$(M(J,1))):PRINT " ";M(J,1);
993 IF Z >=1 THEN PRINT MID$(R$,1,Z);
996 NEXT J: RETURN
1000 REM ===== STOCK MARKET SECURITIES AND DIVIDENDS TABLE
1001 COLOR 0,7:LOCATE 14,45:PRINT" ABBREV.  SECURITY NAME     DIV./SHR ";
1002 COLOR 7,0:LOCATE 15,45:PRINT" HIB  Highway Improvement Bonds $5";
1003 LOCATE 16,45:PRINT" XP   X-Pando Corporation          $1";
1004 LOCATE 17,45:PRINT" SP   Seaside Properties Inc.      none";
1005 LOCATE 18,45:PRINT" ODM  Old Dog Mutual Funds         $4";
1006 LOCATE 19,45:PRINT" RD   Rubble Development           $7";
1007 LOCATE 20,45:PRINT" SO   Slippery Oil Company         none";
1008 LOCATE 21,45:PRINT" BT   Bumpy Transportation         none";
1009 LOCATE 22,45:PRINT" KA   Krash Auto Company           $2";
1010 LOCATE 23,45:PRINT" ZE   Zap Electronics             $6";
1011 LOCATE 24,45:PRINT" BPL  Blinkey Power & Light       $3";
1012 RETURN
1020 FOR N=1 TO P:FOR J = 1 TO 10:M(N,1)=M(N,1)+(T(J)*M(N,J+1)):NEXT J:NEXT N
1030 LOCATE 18,1:PRINT "NET WORTH =     ";:GOSUB 990
1040 PRINT :PRINT :PRINT "PLAY AGAIN (Y OR N) ";
1050 INPUT;R$:IF LEFT$(R$,1) = "N" OR LEFT$(R$,1) = "n" THEN CLS:END
1060 IF LEFT$(R$,1) ="Y" OR LEFT$(R$,1)="y" THEN 340
1070 GOTO 1040
1072 REM ======================
1074 REM * * * GAME DATA * * *
1077 REM ======================
1080 DATA 0,0,0,0,0,0,0,0,5
1090 DATA 0,0,0,0,0,-25,0,0,0
1100 DATA 0,0,0,0,0,0,15,0,0
1110 DATA 0,0,0,-5,0,0,0,0,0
1120 DATA 0,0,0,0,0,0,0,0,5
1130 DATA 0,0,0,0,0,5,0,0,0
1140 DATA 0,0,0,0,0,0,10,0,0,0
1150 DATA 0,10,0,0,0,0,0,0,0,0
1160 DATA 0,0,0,0,0,15,0,0,0
1170 DATA 0,-5,0,0,0,0,0,0,0
1180 DATA 8,5,5,0,0,0,7,0,0
1190 DATA 0,0,0,0,0,0,0,-25,0
1200 DATA 0,0,0,0,0,0,0,10,0
1210 DATA 0,-10,0,0,0,0,0,0,0
1220 DATA 0,5,0,0,0,0,0,0,0
1230 DATA 10,0,0,0,0,0,0,0,0
1240 DATA 0,0,0,0,17,0,0,0,0
1250 DATA 0,0,0,0,-15,0,0,0,0
1260 DATA 0,0,0,0,0,0,0,10,0
1270 DATA 0,0,0,0,0,0,0,-15,0
1280 DATA 0,0,0,0,0,0,0,10,0
1290 DATA 0,0,0,0,0,0,0,-15,0,0
1300 DATA 0,0,-8,0,8,0,0,0,5,0
1310 DATA -10,0,0,0,0,0,0,0,0,0
1320 DATA 8,0,0,0,0,0,0,0,0,0
1330 DATA 0,0,0,0,0,0,-5,0,0
1340 DATA 0,0,3,0,0,0,0,0,0,4
1350 DATA -8,0,0,0,0,0,0,0,0,0
1360 DATA 0,0,0,5,0,0,0,0,0
1370 DATA 0,0,0,0,-10,0,0,0,0
1380 DATA 0,0,0,0,0,0,10,0,0
1390 DATA -8,-5,0,0,0,0,0,-7,0,0
1400 DATA 10,0,0,0,0,0,0,0,0,0
1410 DATA 0,0,0,0,0,0,0,0,-14
1420 DATA -10,0,0,0,0,0,0,0,0,0
1430 DATA 0,0,0,0,0,-5,0,0,0
1440 DATA -2,-10,-7,-9,-2,-9,-7,-16,-4
1450 DATA 26,16,25,8,-14,21,14,-4,17
1460 DATA 18,23,11,12,46,18,-5,34,15
1470 DATA 23,28,-2,11,56,19,30,29,14
1480 DATA 20,15,15,7,-20,15,13,-10,12
1490 DATA 17,21,13,-2,37,23,25,19,14
1500 DATA 19,24,17,9,-5,26,13,-7,15
1510 DATA 11,18,14,11,67,15,22,18,13
1520 DATA 13,31,1,14,-11,18,18,-14,10
1530 DATA 14,-8,19,-1,-9,25,-10,13,19
1540 DATA 24,24,23,20,51,27,28,33,18
1550 DATA 12,14,13,10,20,21,25,8
1560 DATA 7,-6,10,-10,30,6,-19,22,-2
1570 DATA 9,10,7,-5,-20,12,21,18,7
1580 DATA 7,8,5,-6,-40,3,16,-14,4
1590 DATA 8,6,4,-4,-40,8,4,-12,3
1600 DATA 6,4,3,3,-15,5,8,-8,5
1610 DATA 5,7,-1,-3,45,6,-10,10,4
1620 DATA -2,6,-3,-8,-20,7,10,14,6
1630 DATA 11,11,-5,-7,30,10,-11,-18,-4
1640 DATA -5,13,-8,6,25,4,18,-22,-4
1650 DATA -8,-10,-10,-15,-20,-20,-23,-25,-7
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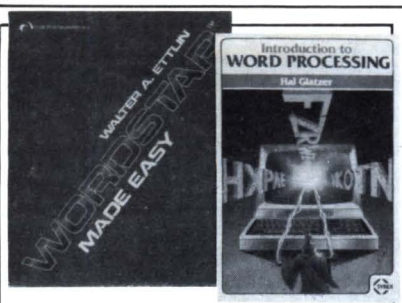

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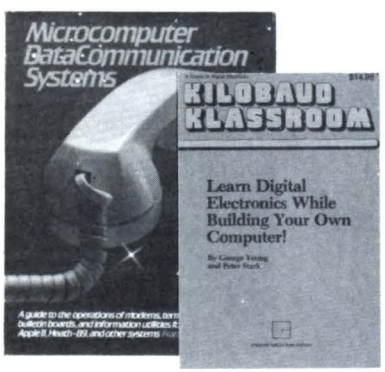

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Programming

Z-80

TRS-80 ASSEMBLY LANGUAGE—by Hubert S. Howe, Jr. This book incorporates into a single volume all the pertinent facts and information you need to know to program and enjoy the TRS-80. Included are clear presentations of all introductory concepts, completely tested practical programs and subroutines, details of ROM and RAM and disk operating systems, plus comprehensive tables, charts and appendices. Suitable for the first time user or more experienced users. BK1217 $9.95.*

INSIDE LEVEL II—For machine language programmers. This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. BK1183 $15.95.*

PROGRAMMING THE Z-80—by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text *and* a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. BK1122 $15.95.*

Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 $16.99.*

PROGRAMMING THE 6502 (Third Edition)—Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. $13.95.* BK1005

6502 APPLICATIONS BOOK—Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. BK1006 $12.95.*

NEW 6502

THE CUSTOM APPLE AND OTHER MYSTERIES—by Winifred Hofacker and Ekkehard Floegel. This is *the* guide to customizing Apple software and hardware, published by the folks at IJ6. It contains such hands on information such as: data acquisition and control applications, Programming the 6522 Internal timer, Constructing the 6522 I/O board, An Eprom Burner for the Apple Computer, An Eprom/RAM board, The Apple Slot Repeater, and much, much more. BK1246 $24.95.

THE APPLE II USER'S GUIDE—By Lon Poole, Martin McNiff, and Steven Cook This guide is the key to unlocking the full power of your Apple II or Apple II Plus. Topics include: "Applesoft and Integer BASIC Programming"—especially how to make the best use of Apple's sound, color and graphics capabilities. "Machine Level Programming," "Hardware Features"—which covers the disk drive and printer, and "Advanced Programming"—describing high resolution graphics techniques and other advanced applications. Well organized and easy to use. BK1220 $16.95

SOME COMMON BASIC PROGRAMS, APPLE II EDITION—by Lon Poole et al. A powerful collection of financial, statistical, home management and mathematics programs—76 in all—Each program is presented with BASIC source code, operating instructions and descriptions. If you're a beginning programmer you can learn from this book what well designed and documented programs look like. BK1232 $14.95

UNDERSTANDING YOUR VIC VOL. 1:BASIC PROGRAMMING—by David Schultz. For the beginning VIC programmer—this book is full of examples and exercises (with expected results included as immediate feedback) that will help you to quickly and easily learn about the VIC. Included are chapters on program design with the use of pseudo code and data dictionaries to refine programming problems, and on VIC color and sound features. A fine learn-by-doing programming guide. BK1234 $11.95.

6502 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods and programming the 6502 interrupt system. BK1176 $16.99.*

68000/6809

6809 MICROCOMPUTER PROGRAMMING AND INTERFACING—by Andrew C. Staugaard, Jr. Getting involved with Tandy's new Color Computer? If so, this new book from the Blacksburg Group will allow you to exploit the awesome power of the machine's 6809 microprocessor. Detailed information on processor architecture, addressing modes, register operation, data movement, arithmetic logic operations, I/O and interfacing is provided, as well as a review section at the end of each chapter. Four appendices are included covering the 6809 instruction set, specification sheets of the 6809 family of processors, other 6800 series equipment and the 6809/6821 Peripheral Interface Adapter. This book is a must for the serious Color Computer owner. BK1215 $13.95.*

68000 MICROPROCESSOR HANDBOOK—By Gerry Kane. Whether you're currently using the 68000, planning to use it, or simply curious about one of the newest and most powerful microprocessors, this handbook has all the answers. A clear presentation of signal conversions, timing diagram conventions, functional logic, three different instruction set tables, exception processing, and family support devices provides more information about the 68000 than the manufacturer's data sheets. A stand alone reference book which can also be used as a supplement to *An Introduction to Microcomputers: Vol. 2—Some Real Microprocessors.* BK1216 $9.95

68000 ASSEMBLY LANGUAGE PROGRAMMING—by Gerry Kane, et al. A straightforward self teaching text book on assembly language programming for the 68000 microprocessor. This book contains the entire instruction set, describes the function of assemblers and assembly instructions and discusses basic software development concepts. A large number of practical programming examples are included. BK1233 $16.99

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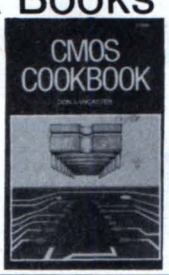

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TTL COOKBOOK—by Don Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. BK1063 $9.50.*

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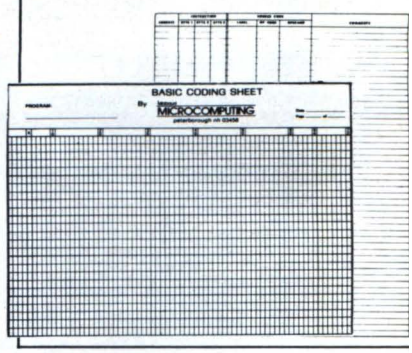

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Basic & Pascal

INTRODUCTION TO TRS-80 LEVEL II BASIC AND COMPUTER PROGRAMMING—by Michael P. Zabinski. Written by an experienced educator, this is the book for those beginners who want to learn about computers without having to become an expert. It has practical programs, useful line-by-line comments, excellent flowcharts accompanied by line numbers and over 200 exercises which help the reader assess progress, reinforce comprehension, and provide valuable practical experience. BK1219 $10.95.*

LEARNING TRS-80 BASIC–by David A. Lien. Dr. Lien, who is the author of THE BASIC HANDBOOK and the original Radio Shack LEVEL I USER'S MANUAL, has compiled a tutorial which includes portions of the original USER'S MANUAL, and most of LEARNING LEVEL II along with extensive additions. It will completely cover the TRS-80 Models I, II, III, and 16 (sorry, not the color or pocket computers). It is, of course, written in the easy learning style which readers of Dr. Lien's books have come to enjoy. BK1175 $19.95.

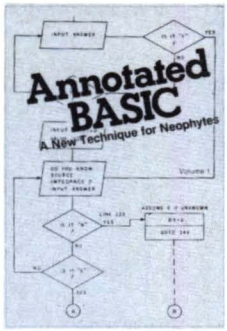
THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 $19.95.*

BASIC BASIC (2ND EDITION)—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. BK1026 $10.50.*

ADVANCED BASIC—Applications including strings and files, coordinate geometry, area, sequences and series, simulation and graphing and games. BK1000 $10.75.*

INTRODUCTION TO PASCAL—by Rodnay Zaks. A step-by-step introduction for anyone wanting to learn the language quickly and completely. Each concept is explained simply and in a logical order. All features of the language are presented in a clear, easy-to-understand format with exercises to test the reader at the end of each chapter. It describes both standard PASCAL and UCSD PASCAL—the most widely used dialect for small computers. No computer or programming experience is necessary. BK1189 $14.95.*

PROGRAMMING IN PASCAL—by Peter Grogono. **A NEW REVISED EDITION**. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich, it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language; it is therefore suitable for an introductory course. BK1140 $12.95.*



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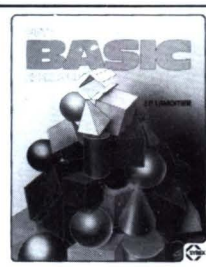

50 BASIC EXERCISES—by J. P. Lamoitier. This book is structured around the idea that the best way to learn a language is through actual practice. It contains 50 completely explained exercises: statement and analysis of the problem, flowcharts, programs and actual runs. Program subjects include mathematics, business, games, and operations research, and are presented in varying levels of difficulty. This format enables anyone to learn BASIC rapidly, checking their progress at each step. BK1192 $12.95*.

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SO YOU ARE THINKING ABOUT A SMALL BUSINESS COMPUTER—by Richard G. Canning and Nancy C. Leeper. For a well-organized manual on the process of selecting the right computer system for your small business, this text can't be excelled. Designed to introduce the novice in data and word processing to the real benefits of computerization, the book is filled with money- and time-saving tips, photos of equipment, lists of suppliers, prices, explanations of computer terminology, and helpful references to additional sources of information. Everyone contemplating a first computer installation should have this book. BK1222 $14.00*

PAYROLL WITH COST ACCOUNTING—IN BASIC— by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in **CBASIC**). BK1001 $20.00.*

SOME COMMON BASIC PROGRAMS— Published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. BK1053 $14.99

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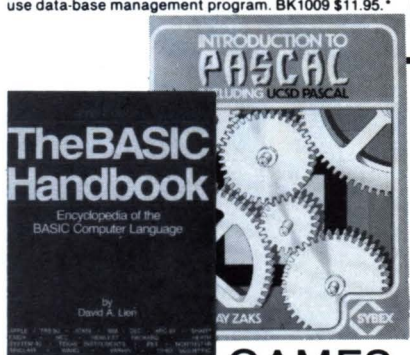

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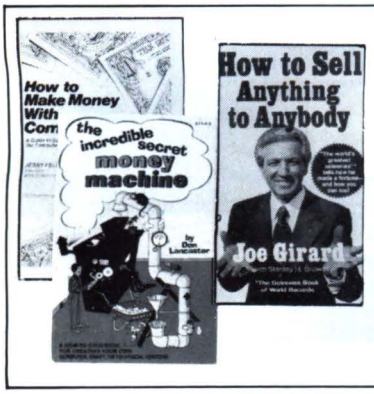

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THE INCREDIBLE SECRET MONEY MACHINE—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you *like* to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. BK1178 $5.95.*

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74LS42	16	.55	74LS161	16	.69	74LS298	16	.89
74LS47	16	.75	74LS162	16	.69	74LS352	16	1.29
74LS48	16	.75	74LS163	16	.69	74LS353	16	1.29
74LS49	14	.75	74LS164	14	.69	74LS365	16	.49
74LS51	14	.25	74LS165	16	1.19	74LS366	16	.49
74LS54	14	.25	74LS168	16	1.19	74LS367	16	.49
74LS55	14	.29	74LS169	16	1.19	74LS368	16	.49
74LS73	14	.39	74LS170	16	1.49	74LS373	20	1.29
74LS74	14	.39	74LS173	16	.69	74LS374	20	1.29
74LS75	16	.39	74LS174	16	.59	74LS375	16	.69
74LS76	16	.39	74LS175	16	.59	74LS386	14	.45
74LS78	14	.39	74LS181	24	2.49	74LS393	14	1.19
74LS83	16	.65	74LS190	16	.89	74LS399	16	1.49
74LS85	16	.69	74LS191	16	.89	74LS670	16	1.49
74LS86	14	.39				81LS95	20	1.49
74LS90	14	.55				81LS97	20	1.49

74S/PROMS*

74S00	14	.35	74S124	16	2.95	74S243	14	2.49
74S02	14	.35	74S133	16	.45	74S244	20	2.49
74S03	14	.35	74S134	16	.50	74S251	16	1.19
74S04	14	.45	74S135	16	.69	74S253	16	1.19
74S05	14	.45	74S136	14	1.39	74S257	16	1.19
74S08	14	.39	74S138	16	.89	74S258	16	1.19
74S09	14	.39	74S139	16	.89	74S260	14	.79
74S10	14	.35	74S140	14	.55	74S280	14	1.95
74S11	14	.35	74S151	16	.99	74S287*	16	1.95
74S15	14	.35	74S153	16	.99	74S288*	16	1.95
74S20	14	.35	74S157	16	.99	74S373	20	2.49
74S22	14	.35	74S158	16	.99	74S374	20	2.49
74S30	14	.35	74S160	16	2.49	74S387*	16	1.95
74S32	14	.45	74S174	16	.99	74S471*	20	5.95
74S38	14	.89	74S175	16	.99	74S472*	20	4.95
74S40	14	.39	74S188*	16	1.49	74S473*	20	4.95
74S51	14	.35	74S194	16	1.49	74S474*	24	4.95
74S64	14	.39	74S195	16	1.49	74S475*	24	4.95
74S65	14	.39	74S196	14	1.49	74S570*	16	2.95
74S74	14	.55	74S240	20	2.25	74S571*	16	2.95
74S86	14	.55	74S241	20	2.25	74S572*	18	4.95
74S112	16	.55	74S242	14	2.49	74S573*	18	4.95
74S113	14	.55				74S940	20	2.49
74S114	14	.55				74S941	20	2.49

CA—LINEAR

CA3010H		.99	CA3060N	16	3.25	CA3089N	16	1.69
CA3013H		2.15	CA3080E	8	.89	CA3096N	16	1.19
CA3023H		3.25	CA3081N	16	1.49	CA3130E	8	1.49
CA3035H		5.95	CA3082N	16	1.49	CA3140E	8	.99
CA3039H		1.35	CA3083N	16	1.49	CA3160H		1.95
CA3046N	14	.89	CA3086N	14	.69	CA3401N	14	.59
CA3059N	14	3.25				CA3600N	14	3.95

CD—CMOS

CD4000	14	.29	CD4040	16	.79	CD4098	16	1.95
CD4001	14	.29	CD4041	14	.79	CD4506	16	1.19
CD4002	14	.29	CD4042	16	.69	CD4507	14	.39
CD4006	14	.89	CD4043	16	.79	CD4508	24	3.95
CD4007	14	.29	CD4044	16	.79	CD4510	16	.89
CD4009	16	.39	CD4046	16	.89	CD4511	16	.89
CD4010	16	.39	CD4047	14	.89	CD4512	16	.89
CD4011	14	.29	CD4048	16	.39	CD4514	24	1.79
CD4012	14	.15	CD4049	16	.39	CD4515	24	1.79
CD4013	14	.39	CD4050	16	.39	CD4516	16	.99
CD4014	16	.79	CD4051	16	.79	CD4518	16	.99
CD4015	16	.39	CD4052	16	.79	CD4519	16	.39
CD4016	14	.39	CD4053	16	.79	CD4520	16	.79
CD4017	16	.75	CD4056	16	2.95	CD4526	16	1.19
CD4018	16	.79	CD4059	24	7.95	CD4528	16	1.19
CD4019	16	.39	CD4060	16	.89	CD4529	16	1.19
CD4020	16	.75	CD4066	14	.39	CD4543	16	1.19
CD4021	16	.79	CD4068	14	.39	CD4562	14	6.95
CD4022	16	.79	CD4069	14	.29	CD4566	16	1.39
CD4023	14	.29	CD4070	14	.39	CD4583	16	2.49
CD4024	14	.69	CD4071	14	.29	CD4584	14	.59
CD4025	14	.23	CD4072	14	.29	CD4723	16	1.19
CD4026	16	2.49	CD4073	14	.29	CD4724	16	1.19
CD4027	16	.45	CD4075	14	.29	MC14409	16	13.95
CD4028	16	.69	CD4076	16	.79	MC14410	16	13.95
CD4029	16	.79	CD4078	14	.49	MC14411	24	11.95
CD4030	14	.39	CD4081	14	.29	MC14412	16	13.95
CD4034	24	1.95	CD4082	14	.29	MC14419	16	7.95
CD4035	16	.89	CD4093	14	.49	MC14433	24	13.95
(More in Catalog)						MC14538	16	1.19
						MC14541	14	1.19

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$9.95
2650	40	MPU	14.95
IDM2901ADC	40	CPU—4-bit slice (Com. Temp. Gr.)	19.95
MCS6502	40	MPU w/Clock (65K bytes mem.)	9.95
MC6802CP	40	MPU w/Clock and RAM	7.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N-6	40	CPU-Sgl. chip 8-bit (128 bts. Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	5.95
INS8070N	40	CPU (64 bytes RAM)	11.95
INS8073N	40	CPU w/Basic Micro Interpreter	14.95
P8085A	40	CPU	5.95

Z80, Z80A, Z80B, Z8000 SERIES

Part No.	**Pins	Function	Price
Z80	40	CPU (MK3880N)(780C) 2MHz	$4.95
Z80-CTC	28	Counter Timer Circuit	5.95
Z80-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80-DMA	40	Direct Memory Access Circuit	15.95
Z80-P10	40	Parallel I/O Interface Controller	5.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	15.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	15.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	15.95
Z80-S10/9	40	Serial I/O	15.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	5.95
Z80A-CTC	28	Counter Timer Circuit	5.95
Z80A-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80A-DMA	40	Direct Memory Access Circuit	17.95
Z80A-P10	40	Parallel I/O Interface Controller	5.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	16.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	16.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	16.95
Z80A-S10/9	40	Serial I/O	16.95
Z80B	40	CPU (MK3880N-6) 6MHz	11.95
Z80B-CTC	28	Counter Timer Circuit	13.95
Z80B-P10	40	Parallel I/O Interface Controller	13.95
Z8001	48	CPU Segmented	51.95
Z8002	40	CPU Non-Segmented	55.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95

6800/68000 SERIES

Part No.	**Pins	Function	Price
MC6800	40	MPU	4.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6810API	24	128x8 Static RAM	3.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	4.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	10.95
MC6850	24	Asynchronous Comm. Adapter	4.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	9.95
MC6862	24	2400bps Modulator	12.95
MC6880A	16	Quad 3-state bus. trans. (MC8T26)	2.25
MC68000L8	64	MPU 16-Bit (8MHz)	69.95
MC68488P	40	General Purpose Int. Adapter	8.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	8.95

8080A SERIES

Part No.	**Pins	Function	Price
INS8080A	40	CPU	3.95
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
INS82C06	20	Octal D Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control	3.95
DP8216	16	Bi-Directional Bus Driver	2.25
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont./Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	5.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element (INS8250)	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	7.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	6.95
DP8303	20	8-Bit Tri-State Bi-Directional Trans.	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.49
DP8307	20	8-bit Bi-Directional Receiver	2.49
DP8308	20	8-bit Bi-Directional Receiver	2.49
DP8310	20	Octal Latched Peripheral Driver	4.95
DP8311	20	Octal Latched Peripheral Driver	4.95

MICROPROCESSOR MANUALS & DATA BOOKS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00
10400	1982 Intel Data Book (1405 pg.)	14.95
30001	1981 Nat. CMOS Book (628 pg.)	6.95
30002	1980 Nat. Interface Book (640 pg.)	6.95
30003	1982 Nat. Linear Book (1952 pg.)	11.95
30005	1981 Nat. TTL Book (624 pg.)	9.95
30008	1980 Nat. Memory Data Book (464 pg.)	6.95
30011	1980 Nat. Linear Applications (736 pg.)	15.95
30013	1983 Zilog Data Book (641 pg.)	7.95
205610	1981 Intel Peripheral Design (828 pg.)	9.95

DYNAMIC RAMS

Part No.	**Pins			Price
1103	18	1024x1	(300ns)	.99
4027	16	4096x1	(250ns)	2.49
4116N-2	16	16,384x1	(150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1	(200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1	(250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1	(150ns)	7.95 - 8/59.95
4164N-200	16	65,536x1	(200ns)	7.49 - 8/54.95
MM5261	18	1024x1	(300ns)	.49 - 8/1.95
MM5262	22	2048x1	(365ns)	.49 - 8/1.95
MM5270	18	4096x1	(250ns) MK4096	4.95
MM5280	22	4096x1	(200ns) 2107	3.95
MM5290-2	16	16,384x1	(150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1	(200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1	(250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1	(200ns)	1.69

STATIC RAMS

1101	16	256x1	(650ns)	1.49
2101	22	256x4	(450ns) 8101	2.49
2102	16	1024x1	(350ns)	.89
21L02	16	1024x1	(450ns) L.P.	1.49
2111	18	256x4	(450ns) 8111	2.95
2112	16	256x4	(450ns) MOS	2.95
2114	18	1024x4	(450ns)	1.95 - 8/13.95
2114L	18	1024x4	(450ns) L.P.	2.25 - 8/15.95
2114-2	18	1024x4	(200ns)	2.25 - 8/15.95
2114L-2	18	1024x4	(200ns) L.P.	2.49 - 8/17.95
2141-3	18	4096x1	(150ns)	3.95
2147	18	4096x1	(70ns)	4.95
2148	18	1024x4	(70ns)	8.95
TMS4044	18	4096x1	(450ns)	3.95
TMS4045	18	1024x4	(450ns)	3.95
5101	22	256x4	(450ns) CMOS	4.95
MM5257	18	4096x1	(450ns) 4044	4.95
HM6116P-3	24	2048x8	(150ns) CMOS	7.95
HM6116-4	24	2048x8	(200ns) CMOS	6.95
HM6116LP-4	24	2048x8	(200ns) L.P. CMOS	7.95
7489	16	16x4	(50ns) 3101	2.25
74C920	22	256x4	(250ns) CMOS (6551)	3.95
74C921	18	256x4	(250ns) CMOS	3.95
74C929	16	1024x1	(250ns) CMOS (6501)	3.95
74C930	18	1024x1	(250ns) CMOS (6518)	3.95
74S189	16	16x4	(35ns) 93405	1.95
74S200	16	256x1	(80ns) 93410	3.95
74S206	16	256x1	(60ns) 93411	3.95
74S289	16	16x4	(35ns) 3101	2.25
82S10	16	1024x1	(50ns) O.C. (93415)	3.95
82S25	16	16x4	(50ns) O.C. (74S289)	2.25

EPROMS

1702A	24	256x8	(1us)	4.95
2708	24	1024x8	(450ns)	3.95
2708-5	24	1024x8	(550ns) SM00246	2.95
TMS2516	24	2048x8	(450ns) 2716	6.95
TMS2532	24	4096x8	(450ns) NMC2532	9.95
TMS2564	28	8192x8	(450ns)	19.95
TMS2716	24	2048x8	(450ns) 3 voltage	7.95
2716	24	2048x8	(450ns)	4.95
2716-1	24	2048x8	(350ns)	6.95
2732	24	4096x8	(450ns)	9.95
2758Q	24	1024x8	(450ns) single +5V	2.95
MM2764	28	8192x8	(450ns)	16.95
MM2764-3	28	8192x8	(300ns)	19.95

PROMS

74S188	16	32x8	PROM O.C. (6330-1)	1.49
74S287	16	256x4	PROM T.S. (6301-1)	1.95
74S288	16	32x8	PROM T.S. (6331-1)	1.95
74S387	16	256x4	PROM O.C. (6300-1)	1.95
74S471	20	256x8	PROM T.S. (6309-1)	5.95
74S472	20	512x8	PROM T.S. (6349-1)	4.95
74S473	20	512x8	PROM O.C. (6348)	4.95
74S474	24	512x8	PROM T.S. (DM87S296N)	4.95
74S475	24	512x8	PROM O.C. (6340)	4.95
74S478	24	1024x8	PROM T.S. (TBP28S86)	8.95
74S570	16	512x4	PROM O.C. (6305)	2.95
74S571	16	512x4	PROM T.S. (6306)	2.95
74S572	18	1024x4	PROM O.C. (6352)	4.95
74S573	18	1024x4	PROM T.S. (82S137)	4.95
82S23	16	32x8	PROM O.C. (27S18)	2.95
82S115	24	512x8	PROM T.S. (27S15)	9.95
82S123	16	32x8	PROM T.S. (27S19)	2.95
82S126	16	256x4	PROM O.C. (27S20)	3.95
82S129	16	256x4	PROM T.S. (27S21)	3.95
82S130	16	512x4	PROM O.C. (27S12)	5.95
82S185	18	2048x4	PROM T.S. (TBP24S81)	9.95
DM87S180N	24	1024x8	PROM O.C. (82S180)	9.95
DM87S181N	24	1024x8	PROM T.S. (82S181)	9.95
DM87S184N	18	2048x4	PROM O.C. (82S184)	9.95
DM87S185N	18	2048x4	PROM T.S. (82S185)	9.95
DM87S190N	24	2048x4	PROM O.C. (82S190)	19.95
DM87S191N	24	2048x8	PROM T.S. (82S191)	19.95

DATA ACQUISITION

DC10		Mostek DC/DC Convert. +5V to -9V	2.95
MC3470P	18	Floppy Disk Read AMP System	4.95
MC1408L7	16	7-bit D/A Converter (DAC0807LCN)	2.49
MC1408L8	18	8-bit D/A Converter (DAC0808LCN)	2.95
ADC0804	20	8-bit A/D Converter (1 LSB)	3.49
DAC0806	16	8-bit D/A Converter (0.78% Lin.)	1.95
ADC0809	28	8-bit A/D Converter (8-Ch. Multi.)	4.49
AY-5-1013A	40	30K BAUD UART (TR1602)	4.95

INTERSIL

*Evaluation Kits

Part No.	**Pins	Function	Price
7045IPI	28	CMOS Precision Timer	14.95
7045EV/Kit*	28	Stopwatch Chip, XTL	19.95
7106CPL	40	3½ Digit A/D (LCD Drive)	9.95
7106EV/Kit*	40	IC, Circuit Board, Display	34.95
7107CPL	40	3½ Digit A/D (LED Drive)	11.95
7107EV/Kit*	40	IC, Circuit Board, Display	29.95
7116CPL	40	3½ Digit A/D LCD Dis. HLD.	16.95
7117CPL	40	3½ Digit A/D LED Dis. HLD.	15.95
7201IUS		Low Battery Volt Indicator	2.25
7205IPG	24	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	24	Stopwatch Chip, XTL	14.95
7206CJPE	16	Tone Generator	4.95
7206CEV/Kit*	16	Tone Generator Chip, XTL	7.95
7207AIPD	14	Oscillator Controller	5.95
7207AEV/Kit*	14	Freq. Counter Chip, XTL	7.95
7208IPI	28	Seven Decade Counter	15.95
7209IPA	8	Clock Generator	3.95
7215IPG	24	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	24	4 Func. Stopwatch Chip, XTL	14.95
7216AIJI	28	8 Digit Univ. Counter C.A.	29.95
7216CIJI	28	8 Digit Freq. Counter C.A.	24.95
7216DIPI	28	8 Digit Freq. Counter C.C.	19.95
7217IJI	28	4 Digit LED Up/Down Counter C.A.	10.95
7217AIPI	28	4 Digit LED Up/Down Counter C.C.	11.95
7224IPL	40	LCD 4½ Digit Up Counter DRI	10.95
7226AIJL	40	8 Digit Univ. Counter	29.95
7226AEV/Kit*	40	5 Function Counter Chip, XTL	74.95
7240IJE	16	CMOS Bin Prog. Timer/Counter	4.95
7242IJA	8	CMOS Divide-by-256 RC Timer	2.25
7250IJE	16	CMOS BCD Prog. Timer/Counter	6.00
7260IJE	16	CMOS BCD Prog. Timer/Counter	5.25
7555IPA	8	CMOS 555 Timer	1.45
7556IPD	14	CMOS 556 Timer	2.20
7611BCPA	8	CMOS Op Amp Comparator 5MV	2.25
7612BCPA	8	CMOS Op Amp Ext. Cmvr. 5MV	2.95
7621BCPA	8	CMOS Dual Op Amp Comp. 5MV	3.95
7631CCPE	16	CMOS Tri Op Amp Comp. 10MV	5.35
7641CCPD	14	CMOS Quad Op Amp Comp. 10MV	7.50
7642CCPD	14	CMOS Quad Op Amp Comp. 10MV	7.50
7660CPA	8	Voltage Converter	2.95
8038CCPD	14	Waveform Generator	3.95
8048CCPE	16	Monolithic Logarithmic Amp	16.95
8069CCQ		50ppm Band—GAP Volt Ref. Diode	2.50
8211CPA	8	Volt Ref/Indicator	2.95
8212CPA	24	Volt Ref/Indicator	2.95
30009		**1983 Intersil Data Book (1356 pages)**	**$9.95**

74C—C/MOS

74C00	14	.35	74C95	14	1.39	74C221	16	1.95
74C02	14	.35	74C107	14	.89	74C240	20	1.95
74C04	14	.29	74C151	16	2.49	74C244	20	1.95
74C08	14	.35	74C154	24	3.49	74C373	20	2.49
74C10	14	.35	74C157	16	2.25	74C374	20	2.49
74C14	14	.59	74C160	16	1.19	74C901	14	.59
74C20	14	.35	74C161	16	1.19	74C903	14	.59
74C30	14	.35	74C162	16	1.19	74C906	14	.59
74C32	14	.39	74C163	16	1.19	74C911	28	8.95
74C42	16	1.39	74C164	14	1.49	74C912	28	8.95
74C48	16	1.95	74C173	16	.79	74C915	18	1.19
74C73	14	.79	74C174	16	1.19	74C917	28	8.95
74C74	14	.69	74C175	16	1.19	74C922	18	4.49
74C85	16	1.95	74C192	16	1.49	74C923	20	4.95
74C86	14	.39	74C193	16	1.69	74C925	16	5.95
74C89	16	5.95	74C195	16	1.39	74C926	18	5.95
74C90	14	1.19				80C95	16	.39
74C93	14	1.19				80C97	16	.39

NEW PRODUCT! 74HC High Speed CMOS

74HC00	14	.75	74HC138	16	1.49	74HC243	14	2.79
74HC02	14	.75	74HC139	16	1.49	74HC251	16	1.19
*74HCU04	14	.75	74HC147	16	1.19	74HC266	14	.99
74HC08	14	.75	74HC151	16	1.19	74HC280	14	4.95
74HC10	14	.75	74HC157	16	1.19	74HC373	20	3.95
74HC20	14	.75	74HC160	16	1.79	74HC374	20	3.95
74HC27	14	.75	74HC161	16	1.79	74HC533	20	3.95
74HC74	14	.99	74HC164	14	1.79	74HC534	20	3.95
74HC75	16	.99	74HC174	16	1.39	74HC4075	14	.75
74HC86	14	.99	74HC175	16	1.39	74HC4538	16	2.95
74HC109	16	1.39	74HC242	14	2.79	74HC4543	16	4.95

*74HCU04 is unbuffered. All others are buffered. **Send $.30 for Data Sheet.**

NEW Programmable Array Logic (PALS)

Part No.	**Pins	Function	Price
PAL10H8	20	Octal 10-Input AND-OR Gate Array (High Output)	$5.95
PAL12H6	20	Hex 12-Input AND-OR Gate Array (High Output)	5.95
PAL14H4	20	Quad 14-Input AND-OR Gate Array (High Output)	5.95
PAL10L8	20	Octal 10-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL12L6	20	Hex 12-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL14L4	20	Quad 14-Input AND-OR-Invert Gate Array (Low Output)	5.95
PAL16L8	20	Octal 16-Input AND-OR-Invert Gate Array (Low Output)	9.95
PAL16R8	20	Octal 16-Input Register AND-OR Gate Array	9.95
PAL16R6	20	Hex 16-Input Register AND-OR Gate Array	9.95
PAL16R4	20	Quad 16-Input Register AND-OR Gate Array	9.95
30012		**1982 National PAL Data Book (176 pages)**	**$5.95**

LINEAR

TL071CP	8	.79	LM340K-15		1.35	NE570N	16	3.95
TL072CP	8	1.39	LM340T-5		.79	LM703CN	8	1.19
TL074CN	14	1.95	LM340T-12		.79	LM709N	14	.49
TL081CP	8	.59	LM340T-15		.79	LM710N	14	.69
TL082CP	8	1.19	LM348N	14	.99	LM711N	14	.79
TL084CN	14	1.95	LM350K		4.95	LM723N	14	.55
LM301CN	8	.35	LF355N	8	1.10	LM733N	14	1.00
LM302H		1.95	LF356N	8	1.10	LM739N	14	1.95
LM304H		1.95	LM370N	14	4.49	LM741CN	8	.35
LM305H		.99	LM373N	14	3.95	LM747N	14	.69
LM307CN	8	.45	LM377N	14	1.95	LM748N	8	.59
LM308CN	8	.69	LM380N	14	.89	LM1310N	14	1.49
LM309K		1.25	LM381N	14	1.79	LM1458CN	8	.59
LM310CN	8	1.75	LM382N	14	1.39	LM1488N	14	.69
LM311CN	8	.69	LM384N	14	1.79	LM1489N	14	.69
LM312H		2.49	LM386N-3	8	.89	LM1496N	14	1.95
LM317T		1.19	TL494CN	16	2.95	LM1800N	16	1.49
LM317K		3.95	TL496CP	8	1.19	LM1889N	18	1.95
LM318CN	8	1.95	NE510A	14	4.95	LM1896N	14	2.95
LM319N	14	1.95	NE529A	14	2.95	LM2002T		1.49
LM320K-5		1.35	NE531V	8	2.95	LM3189N	16	1.59
LM320K-12		1.35	NE536H		8.95	LM3900N	14	.59
LM320K-15		1.35	NE540H		4.95	LM3905CN	8	1.19
LM320T-5		.89	NE544N	14	2.95	LM3909N	8	.99
LM320T-12		.89	NE550A	14	1.95	LM3914N	18	3.49
LM320T-15		.89	NE555V	8	.35	LM3915N	18	3.49
LM323K		5.95	LM556N	14	.69	LM3916N	18	3.49
LM324N	14	.59	NE564N	16	2.95	RC4136N	14	1.25
LM337T		1.95	LM565N	14	1.19	RC4151NB	8	1.95
LM338K		6.95	LM566CN	8	1.49	ICL8038B	14	3.95
LM339N	14	.69	LM567V	8	.89	LM13080N	8	1.19
LM340K-5		1.35				LM13600N	16	1.19
LM340K-12		1.35				MORE AVAILABLE		

CONNECTORS

DB25 — D Subminiature (meets RS232)

Part No.	Description	Price
DE9P	9 Pin Plug	$1.79
DE9S	9 Pin Socket	1.95
DA15P	15 Pin Plug	1.95
DA15S	15 Pin Socket	2.95
DB25P	**25 Pin Plug (Meets RS232)**	**2.49**
DB25S	**25 Pin Socket (Meets RS232)**	**3.25**
DB25P-831	25 Pin Right Angle Plug	4.95
DB25S-831	25 Pin Right Angle Socket	5.25
DC37P	37 Pin Plug	4.95
DC37S	37 Pin Socket	5.95
DD50P	50 Pin Plug	5.95
DD50S	50 Pin Socket	6.95

Accessories

DE-9H	Hood for DE-9 Series Connectors	$1.19
DA-15H	Hood for DA-15 Series Connectors	1.29
DB25H	Hood for DB25 Series Connectors	1.25
DC37H	Hood for DC37 Series Connectors	1.39
DD50H	Hood for DD50 Series Connectors	1.49
D20418-2	2 screws for mtg. connectors to a panel	.79

Solder Eyelet/Wire Wrap Edge Card

Part No.	Cnts.	Sp.	Description	Price
15/30SE	15/30	.156	Solder Eyelet	$1.79
18/36SE	18/36	.156	Solder Eyelet	1.95
22/44SE	22/44	.156	Solder Eyelet	2.49
22/44PC	22/44	.156	PC type (no mtg. ears)	.99
50/100SE	50/100	.125	Solder Eyelet	9.95
22/44WW	22/44	.156	Wire Wrap - Level 3	4.95
67031-5	22/44	.156	WW (Pins .0625x.03x.75)	3.95
R-681-1	50/100	.125	Wire Wrap - Level 3	7.95
R-681-2	50/100	.125	Wire Wrap - Level 1	6.95

RF Coaxial Connectors

Part No.	Description	Price
PL259	UHF Plug	$ .89
S0239	UHF Panel Receptacle	.69
PL258	UHF Straight Adapter	.89
UG175/U	UHF Reducing Adapter	.49
UG88/U	BNC Plug	1.49
UG89/U	BNC Jack	1.69
UG306/U	BNC Angle Adapter	2.49
UG260/U	BNC Plug	1.49
UG1094/U	BNC Bulkhead Receptacle	.89

IC SOCKETS

For Socket Required, See Column After The IC Part No.

LOW PROFILE (TIN) SOCKETS

	1-9	10-99	100-999
8 pin LP	.16	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.46	.43

— Soldertail Standard Tin & Gold Also Available —

WIRE WRAP (GOLD) SOCKETS LEVEL #3

	1-9	10-99	100-999
8 pin WW	.49	.45	.42
10 pin WW	.65	.62	.59
14 pin WW	.65	.62	.59
16 pin WW	.69	.65	.61
18 pin WW	.89	.85	.79
20 pin WW	1.09	1.05	.99
22 pin WW	1.25	1.19	1.15
24 pin WW	1.29	1.23	1.18
28 pin WW	1.59	1.50	1.45
36 pin WW	1.85	1.75	1.69
40 pin WW	1.99	1.89	1.79

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30¢ each
Send $1.00 Postage for your
FREE 1983 JAMECO CATALOG
Prices Subject to Change

Call for Quantity Discounts

Mail Order Electronics · Worldwide
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NEW! Telex Number Telex 176043

1355 SHOREWAY ROAD, BELMONT, CA 94002
12/82 ***PHONE ORDERS WELCOME — (415) 592-8097***

CAPACITOR CORNER

50 VOLT CERAMIC DISC CAPACITORS

Value	1-9	10-99	100+	Value	1-9	10-99	100+
10 pf	.08	.06	.05	.001µF	.08	.06	.05
22 pf	.08	.06	.05	.0047µF	.08	.06	.05
47 pf	.08	.06	.05	.01µF	.08	.06	.05
100 pf	.08	.06	.05	.022µF	.09	.07	.06
220 pf	.08	.06	.05	.047µF	.09	.07	.06
470 pf	.08	.06	.05	.1µF	.15	.12	.10

MINI. ALUMINUM ELECTROLYTIC CAPACITORS

Axial	1-99	100-499	500+	Radial	1-99	100-499	500+
.47/50V	.16	.14	.10	.47/25V	.15	.13	.12
1.0/50V	.19	.16	.12	.47/50V	.16	.14	.13
3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21
470/25V	.54	.49	.45	100/50V	.37	.34	.31
1000/16V	.79	.69	.61	220/16V	.25	.21	.19
2200/16V	.89	.79	.69	470/25V	.35	.31	.27

Circle 41 on Reader Service card.

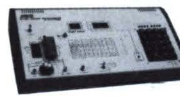
2708,2716,2732 & 2764 EPROM Programmer

JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES

Self-Contained — Requires No Additional Systems for Operation

NEW!



• Programs, validates, and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer Interface for editing/program loading • Loads data into RAM by keyboard • Changes data in RAM by keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power Input: 115VAC, 60Hz, ◄ 10W power consumption • Enclosure: Color-coordinated, light tan panels w/molded mocha brown end pieces • Size: 15-5/8"L x 8¾"D x 3½"H • Wt.: 5¾ lbs.

JE664-A EPROM Programmer **$995.00**
Assembled & Tested (Includes JM16A Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C Interface Option implements computer access to the JE664's RAM. Sample software written in BASIC provided for TRS-80® Model I, Level II Computer. Baud rate: 9600. Word Lgth: 8 bits - odd parity. Stop bits: 2. Option may be adapted to other computers.

JE664-ARS EPROM Prog. w/JE665 Option **$1195.00**
Assembled and Tested (Includes JM16A Module)

EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM.

Part No.	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI	$14.95
JM16A	2716, TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16B	TMS2716	Motorola, TI (+5,-12,+12)	$14.95
JM32A	TMS2532	Motorola, TI	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM64A	MCM68764, MCM68L764	Motorola	$14.95
JM64B	2764	Intel	$14.95
JM64C	TMS2564	TI	$14.95

CONSUMER PRODUCTS

SECURITY ALARM SYSTEMS

Home Alarm System

• Self-Installation • Presettable w/individual 3-digit code — no key nec. • Instant or 10-sec. delayed warning system • Alarm system incl. window & door contacts • One 9V battery required (not incl.) Low power consumption (0.01mA) • Loud audible alarm (90db) • Delayed exit feature • System complete w/one control station with built-in siren and test button; 4 magnetic contact sets & connecting wires for entire system

ST-05 Home Alarm System **$59.95**

Door Security System

• Coded door alarm. • Instant or 7-second delay system. • Alarm activated as door is opened. • Can be de-activated by pressing personal code. • Power: One 9V battery (not incl.). • System includes one personal coded keyboard and one magnetic sensor.

ES-07 Door Alarm **$29.95**

Anti-Theft Auto Alarm System

• Audible horn is activated when door or trunk is opened • Alarm sounds for 3 min. — unless turned off by secret 3-digit code. • Wire cutting will not deactivate alarm. • Code set by owner. • Uses only 0.01mA power. • System complete w/one black-box control unit; one personal coded keyboard; 2 sets of sensors; one audible horn; & wiring (incl. one 10A fuse).

CA-06 Auto Alarm **$59.95**

DIGITAL QUARTZ TIME PEN

• 5-Function: Hours, Minutes, Seconds, Month, Day • Liquid Crystal Display • 1/8" digits • Battery included • Uses standard Parker ink refills • Ultra-slim design (5½" x ¼")

77ILK Black/Gold Trim .... **$9.95 each**
77ISG Stainless Steel/Gold Trim .... **$9.95 each**
77ILR Red/Gold Trim .... **$9.95 each**

STICK-ON CLOCK

5-Function LCD Quartz Digital

• Hours • Minutes • Seconds • Month • Day • Flashing Colon • Ideal for car, kitchen, bathroom, office, etc. • 1/4" digits • Runs 2 years on 1 battery (incl.) • Size: 1-3/8" Round. Specify color: Red/ST-001R; White/ST-001W; Black/ST-001B

#ST-001____ (Specify letter) .... **$4.95 each or 2/$8.95**

Stereo Cassette Player

with FM Stereo Tuner Pack

- **Lightweight Headphones**
- **Cr02/Metal/Normal Tape Selector**
- **Anti-Rolling Mechanism**

FEATURES: • Blue carrying case, shoulder strap, belt strap, lightweight headphones, FM stereo tuner pack & instruction manual • Talkline • Tone selector • Cr02/Metal/Normal tape selector • LED operation indicator • Built-in microphone • Stop/eject, play, rewind/review, fast forward/cue, tape/radio selector functions • Vol. control • Ext. power input jack • Headphone jack • Auto-stop mechanism (shuts off player when tape ends) • Anti-rolling mechanism (prevents sound from quivering when walking, jogging, etc.) • Weight: 13 oz. • Requires 4 AA batteries (not included) • Size: 6"L x 4"W x 1-1/8"H

Model TWF-802 .... $69.95
AM3-4 AA Alkaline Batteries .... 4/$3.95

UTIC

Mini Stereo AM/FM Receiver

WITH HEADPHONES
For Joggers, Cyclists, Skaters & Sports Events

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case and shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl. - see below). Compact size: 3-1/8"H x 4-7/8"L x 1"D. Wt. 6 oz.

Model 2830 .... $29.95
AM3-3 AA Alkaline Batteries .... 3/$2.95

KEYBOARDS — POWER SUPPLIES

16⅞"L x 5¼"W x 1⅝"H

MICRO SWITCH 69-KEY KEYBOARD
Data Entry Keyboard, Encoded Output: 8-bit Parallel EBC DIC. Switching: Hall Effect, 24-pin Edge Card Connection. Complete w/Pin Connection. Can easily be modified to ASCII code.
Part No. KB69SD12-2 (Fits into DTE-20 Enclosure) .... $19.95 each

23"Lx5¾"Wx1-3/8"H

MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.
Part No. 85SD18-1 .... $29.95 each

18¼"L x 5¾"W x 1$^{9}/_{16}$"H

MICRO SWITCH 88-KEY KEYBOARD (PARALLEL)
Data Entry Keyboard used in a Diablo 1640 Terminal. Supply Voltage: +5V, -12V. Switching: Hall Effect — 10-pin Edge Card Connection. Schematic included. Uses 8048 Encoder Chip.
Part No. 88SD22 (Fits into DTE-20 Enclosure) .... $69.95 each

POWER SUPPLY +5VDC @ 1 AMP REGULATED *Transaction Tech*
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 2-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. 6½"W x 7"D x 2¼"H. Wt. 3 lbs. Data sheet incl.
Part No. PS51194 .... $19.95 each

POWER SUPPLY +5VDC @ 1 AMP REGULATED *B Industries*
Output +5VDC @ 1 amp, +36-42VDC adj. 400mA or less, 30VAC (isol.) @ 1.5 amp. Input 115VAC 60Hz. Circ. brkr. re-set button. Blk. self-encl. case w/4 rubber feet. 6 ft., 3 cond. blk. pow. cord. On/off switch. 6¾"W x 7¾"D x 3-7/8"H - wt. 7 lbs. Data sheet included.
Part No. PS407D .... $24.95 each

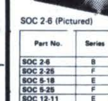
POWER SUPPLY +5VDC @ 3 AMP REGULATED *Deltron*
Input: 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 6VDC @ 2.5 amp. Adjustable current limit, Ripple & Noise: 1MV rms, 5MV p-p — 2 mounting surfaces. UL recognized. Size: 4"W x 4½"L x 2-7/16"H - wt. 2 lbs. Data sheet included.
Part No. QPS-1 .... $29.95 each

MULTI-VOLTAGE POWER SUPPLY +5, +12, —12VDC REGULATED
Input: 105-125VAC, 47-63Hz / 205-250VAC, 47-63Hz. Output: +5VDC @ 2 amps Adj., 5VDC @ 50mA Fixed, +12VDC @ 1 amp Adj., —12V @ 2 amp adj. Overvoltage protection. Size: 12½"L x 4-7/8"W x 3¾"D. Data sheet included.
Part No. RA0250 .... $39.95 each

POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 8 ft. blk. pow. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94V0 .... $49.95 each

POWER SUPPLY 4-Channel Switching Power Supply
Microprocessor, mini-computer, terminal, medical equipment and process control applications. Input: 90-130VAC 47-440Hz. Output: +5VDC @ 5A, -5VDC @ 1A; +12VDC @ 1A, -12VDC @ 1A. Line reg.: ±0.2%. Ripple: 30mV p-p. Load reg.: ±1%. Overcurrent protection. Adj: 5V main output±10%. 6-3/8"L x 1-7/8"W x 4-15/16"H. Wt. 1½ lbs.
Part No. FCS-604A .... $69.95 each

POWER SUPPLY Adjustable Switching 4-24VDC to 5 Amps
Adj. 4-24VDC; 5VDC @ 5A, 6VDC @ 4.8A, 9VDC @ 4.1A, 12VDC @ 3.3A, 18VDC @ 1.9A, 24VDC @ .5A. Overvoltage Protection. Input: 115VAC 50/60Hz. Output variations within 20mV. 8.25"L x 4.25"W x 2.25"H. Wt. 3.25 lbs.
JE224 Kit .... $79.95 each
JE224A Assembled & Tested **........................ $99.95 each**



SOC 2-6 (Pictured)

SORENSEN Regulated Power Supplies

Sorensen's open construction (SOC) power supplies are series-regulated solid-state systems, designed to provide reg. DC voltages at 6 levels (2-28 v/range). These units are open-framed on sturdy black anodized aluminum for excellent mounting.

FEATURES: 115/208/230VAC Input @ 50-63Hz. Low Ripple: 1.5mVrms, 5mV P-P maximum. Adjustable current limit. Voltage adjustment control. All schematics and specifications supplied with unit. Series A,B,C,E have three mounting surfaces (Series F, bottom mounting only).

Part No.	Series	Output Voltage Adjustment Range min.	Output Voltage Adjustment Range max.	Output Current amps (Adc) @40°C	@50°C	@60°C	Size (Inches)	Weight	Price
SOC 2-6	B	1.9	2.1	6.0	4.9	3.8	5.62 x 4.88 x 2.50	4.3 lbs.	$19.95
SOC 2-25	F	1.9	2.1	26.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	29.95
SOC 5-18	E	4.25	5.25	18.0	15.0	12.0	14.00 x 4.88 x 2.75	12 lbs.	39.95
SOC 5-25	F	4.25	5.25	25.0	21.5	17.5	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 12-11	E	11.4	12.6	11.0	9.2	6.8	14.00 x 4.88 x 1.62	12 lbs.	44.95
SOC15-5	C	14.25	15.75	5.0	4.2	3.5	7.00 x 4.88 x 3.37	6.6 lbs.	39.95
SOC 15-9.5	E	14.25	15.75	9.5	7.6	5.6	14.00 x 4.88 x 1.62	12. lbs.	44.95
SOC 15-13	F	14.25	15.75	13.0	10.5	8.0	16.00 x 4.88 x 4.88	16 lbs.	49.95
SOC 28-0.8	A	26.6	29.4	0.8	.64	.45	4.00 x 4.88 x 1.62	2 lbs.	24.95

BUG BOX™ — 30 individual compartments • Stores 60 8-pin or 30 14- or 16-pin DIPs • Heavy duty injection molded plastic • Clear plastic cover slides & locks • Cover marked w/numbers 1-30 • Compartment size: 1" x 3.75" x .5" deep • Box size: 4.9" x 3.3" x .6" • Weight: 1.75 oz.

BUG BOX™
Please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code	QTY	PRICE
BGX-001-( )	1	$ 2.29
BGX-010-( )	10	19.99
ANTI-STATIC		
BGX-001-( )AS	1	$ 3.29
BGX-010-( )AS	10	28.89

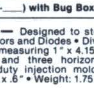
BUG CAGE™ — 12 locations store Bug Boxes, Big Bug Boxes or Bug Trays • Modular and interlocking • Heavy duty injection molded plastic • Each cage has 6 slip-on locations • 2 cages per pkg. • Cage size: 5-1/8" x 5" x 3-7/8" • 4 colors available — please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code		Price
BGC-001-(	) 2 Cages (6 loc. ea.)	$11.95/pkg.

BUG TRAY™ — Stores in Bug Cage • Molded plastic • Three styles: Open (1 compartment 3.05" x 4.6" x .6"); Vertical (5 compartments .5" x 4.6" x .6"); and Horizontal (8 compartments .4" x 3.95" x .6") • Ideal for tools, hardware, components, etc. • Tray size: 3.55" x 5.05" x .6" • Black color only

PART NO.	DESCRIPTION	PRICE
BTH-001	Horizontal Bug Tray	$1.95
BTV-001	Vertical Bug Tray	1.95
BTO-001	Open Bug Tray	1.95
BTX-003	1 of each Bug Tray (3)	4.98

BUG BOX™ STORAGE SYSTEMS



BUG CAGE™ (BGC-001-____) with Bug Boxes

LSI BIG BUG BOX™ — Designed to store large IC's, Resistors, Capacitors and Diodes • Divided into three compartments measuring 1" x 4.15" x .5" deep • Three vertical and three horizontal dividers included • Heavy duty injection molded plastic • Box size: 4.9" x 3.3" x .6" • Weight: 1.75 oz.

LSI BIG BUG BOX™
Please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

PART NO./COLOR CODE	QTY	PRICE
BLX-001-( )	1	$ 3.29
BLX-010-( )	10	28.79
ANTI-STATIC		
BLX-001-( )AS	1	$ 4.29
BLX-010-( )AS	10	37.89

BACK PACK™ — Self-adhesive labels for the back of ICs • Shows exact internal logic in relation to IC pins • 532 labels in each package (including several blank labels) • Each package for 8, 14, 16, 24, 28 and 40-pin ICs • Combo package includes 1,068 labels for TTL and CMOS ICs • Microprocessor package contains 744 labels

Part No.	Description	Price
BPT-012	TTL	$7.95
BPC-012	CMOS	8.95
BPM-012	Combo	14.95
BPU-012	Microprocessor	9.95

Custom Jumpers!

JUMPER AND CABLE ASSEMBLIES

Custom Cables!

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	2.95
DJ14-2-14	924106-24	14	double end	24"	3.19
DJ14-3-14	924106-36	14	double end	36"	3.49
DJ16-1	924112-12	16	single end	12"	1.89
DJ16-2	924112-24	16	single end	24"	2.19
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	2.95
DJ16-2-16	924116-24	16	double end	24"	3.29
DJ16-3-16	924116-36	16	double end	36"	3.59
DJ24-1	924122-12	24	single end	12"	2.69
DJ24-2	924122-24	24	single end	24"	3.19
DJ24-3	924122-36	24	single end	36"	3.59
DJ24-1-24	924126-12	24	double end	12"	4.49
DJ24-2-24	924126-24	24	double end	24"	4.95
DJ24-3-24	924126-36	24	double end	36"	5.39

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ40-1	924132-12	40	single end	12"	5.39
DJ40-2	924132-24	40	single end	24"	6.19
DJ40-3	924132-36	40	single end	36"	6.89
DJ40-1-40	924136-12	40	double end	12"	9.49
DJ40-2-40	924136-24	40	double end	24"	10.29
DJ40-3-40	924136-36	40	double end	36"	10.95

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4-foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
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12/82

5¼" Mini-Floppy Disc Drive

FOR TRS-80 MODEL I (Industry Standard)

Pertec Computer Corp.

Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6 amps max., +5VDC (±0.25V) 0.8 amps max. Unit as pictured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3½ pounds. Size: 5¾"W x 8"D x 3¼"H

Limited Quantity!

Part No.	Price
FD200	$179.95
Single-sided, 40 tracks, 250K bytes capacity	
FD250	$199.95
Double-sided, 35 tracks, 438K bytes capacity	

EXPAND YOUR TRS-80

to 16K, 32K, or 48K

****Model 1 = From 4K to 16K Requires (1) One Kit**
Model 3 = From 4K to 48K Requires (3) Three Kits
Color = From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-80 16K Conversion Kit

Kit comes complete with 8 each MM5290 (UPD416/4116) 16K Dynamic RAM (*ns) and documentation for conversion.

TRS-16K2 *150ns $14.95
TRS-16K3 *200ns $12.95
TRS-16K4 *250ns $10.95

TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 ea. 4164-2 (200ns). 64K Dyn. RAMs & conversion documentation. Converts TRS-80 color computers from 4K-32K Memory or 16K-64K Memory.

TRS-64K2 (200ns) **$54.95**

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- 3.125" sq. x 1.665" depth
- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz
- For Apple users

*Metal Frame

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- 10 yrs. cont. duty at 20°C
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- 115V 50/60Hz 14W Wt. 17 oz.

*Metal Frame

MU2A1-U Cleaned & tested (used) .... **$9.95 ea.**
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JOYSTICKS

JS-5K (Pictured)

JS-5K	5K Linear Taper Pots	$5.25
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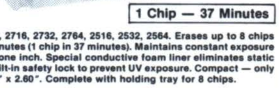
UV-EPROM Eraser

8 Chips — 51 Minutes



1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

UVS-11EL Replacement Bulb $16.95
DE-4 UV-EPROM Eraser $79.95

AC250 (Pictured)

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Part No.	Input	Output	Price
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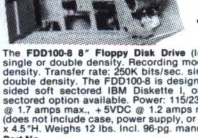
AC9004	117V/60Hz	9.2VAC 2.5 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA	$1.95
DC6912	120V/60Hz	6,9,12VDC 300mA	$8.95
DC5490	117V/60Hz	9.5VDC 275mA	$2.95
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95
DV9200	117V/60Hz	9VAC 200mA	$3.25

Siemens 8" Floppy Disk Drive



- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The **FDD100-8 8" Floppy Disk Drive** (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or eq. disk cartridge. Hard-sectored option available. Power: 115/230VAC @ 50-60Hz, +24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs. Incl. 96-pg. manual.

Part No.		Price
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FDD100-8	Buy 2 for	$259.95 each
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LM301	.34	LM339	.99	NE564	2.95	LM1496	.85
LM301H	.79	LM340 (see 7800)		LM565	.99	LM1558H	3.10
LM307	.45	LM348	.99	LM566	1.49	LM1800	2.37
LM308	.69	LM350K	4.95	LM567	.89	LM1812	8.25
LM308H	1.15	LM350T	4.60	NE570	3.95	LM1830	3.50
LM309H	1.95	LM358	.69	NE571	2.95	LM1871	5.49
LM309K	1.25	LM359	1.79	NE592	2.75	LM1872	5.49
LM310	1.75	LM376	3.75	LM703	.89	LM1877	3.25
LM311	.64	LM377	1.95	LM709	.59	LM1889	1.95
LM311H	.89	LM378	2.50	LM710	.75	LM1896	1.75
LM312H	1.75	LM379	4.50	LM711	.79	LM2877	2.05
LM317K	3.95	LM380	.89	LM723	.49	LM2878	2.25
LM317T	1.19	LM380N-8	1.10	LM723H	.55	LM2900	.85
LM318	1.49	LM381	1.60	LM733	.98	LM2901	1.00
LM318H	1.59	LM382	1.60	LM741N-8	.35	LM3900	.59
LM319H	1.25	LM383	1.95	LM741N-14	.35	LM3905	1.25
LM319	1.25	LM384	1.95	LM741H	.40	LM3909	.98
LM320 (see 7900)		LM386	.89	LM747	.69	LM3911	2.25
LM322	1.65	LM387	1.40	LM748	.59	LM3914	3.95
LM323K	4.95	LM389	1.35	LM1014	1.19	LM3915	3.95
LM324	.59	LM390	1.95	LM1303	1.95	LM3916	3.95
LM329	.65	LM392	.69	LM1310	1.49	MC4024	3.95
LM331	3.95	LM394H	4.60	MC1330	1.69	MC4044	4.50
LM334	1.19	LM399H	5.00	MC1349	1.89	RC4136	1.25
LM335	1.40	NE531	2.95	MC1350	1.19	RC4151	3.95
LM336	1.75	NE536	6.00	MC1358	1.69	LM4250	1.75
LM337K	3.95	NE555	.34	LM1414	1.59	LM4500	3.25
LM337T	1.95	NE556	.65	LM1458	.59	LM13080	1.29
LM338K	6.95	NE558	1.50	LM1488	.69	LM13600	1.49
		NE561	19.95	LM1489	.69	LM13700	1.49

H = TO-5 CAN T = TO-220 K = TO-3

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CA 3039	1.29	CA 3083	1.55
CA 3046	1.25	CA 3086	.80
CA 3059	2.90	CA 3089	2.99
CA 3060	2.90	CA 3096	3.49
CA 3065	1.75	CA 3130	1.30
CA 3080	1.10	CA 3140	1.15
CA 3081	1.65	CA 3146	1.85
		CA 3160	1.19

TI

TL494	4.20	75365	1.95
TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
		75494	.89

BI FET

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TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
		LF357	1.40

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7815T	.89	7915T	.99
7824T	.89	7924T	.99
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
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78H12K	9.95	UA78S40	1.95

T = TO-220 K = TO-3
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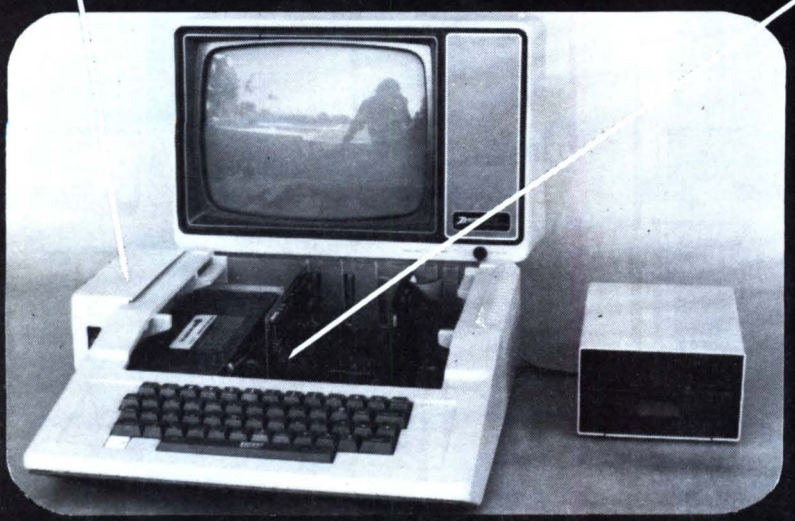

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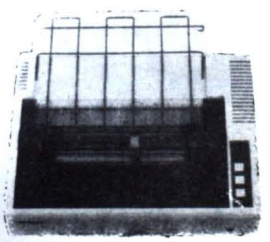

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2114	1024 x 4 (450ns)	8/14.95
2114L-4	1024 x 4 (450ns) (LP)	8/15.25
2114L-3	1024 x 4 (300ns) (LP)	8/15.45
2114L-2	1024 x 4 (200ns) (LP)	8/15.95
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TMS4044-4	4096 x 1 (450ns)	3.49
TMS4044-3	4096 x 1 (300ns)	3.99
TMS4044-2	4096 x 1 (200ns)	4.49
MK4118	1024 x 8 (250ns)	9.95
TMM2016-200	2048 x 8 (200ns)	4.15
TMM2016-150	2048 x 8 (150ns)	4.95
TMM2016-100	2048 x 8 (100ns)	6.15
HM6116-4	2048 x 8 (200ns) (cmos)	4.95
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HM6116LP-3	2048 x 8 (150ns) (cmos)(LP)	8.95
HM6116LP-2	2048 x 8 (120ns) (cmos)(LP)	10.95
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PE-24T	X	9	6,700	175.00
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1 MHZ

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74LS02	.25	74LS91	.89	74LS173	.69	74LS352	1.29
74LS03	.25	74LS92	.55	74LS174	.55	74LS353	1.29
74LS04	.24	74LS93	.55	74LS175	.55	74LS363	1.35
74LS05	.25	74LS95	.75	74LS181	2.15	74LS364	1.95
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74LS11	.35	74LS112	.39	74LS192	.79	74LS368	.45
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74LS14	.59	74LS122	.45	74LS195	.69	74LS377	1.39
74LS15	.35	74LS123	.79	74LS196	.79	74LS378	1.18
74LS20	.25	74LS124	2.90	74LS197	.79	74LS379	1.35
74LS21	.29	74LS125	.49	74LS221	.89	74LS385	1.90
74LS22	.25	74LS126	.49	74LS240	.95	74LS386	.45
74LS26	.29	74LS132	.59	74LS241	.99	74LS390	1.19
74LS27	.29	74LS133	.59	74LS242	.99	74LS393	1.19
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74LS32	.29	74LS138	.55	74LS245	1.49	74LS424	2.95
74LS33	.55	74LS139	.55	74LS247	.75	74LS447	.37
74LS37	.35	74LS145	1.20	74LS248	.99	74LS490	1.95
74LS38	.35	74LS147	2.49	74LS249	.99	74LS624	3.99
74LS40	.25	74LS148	1.35	74LS251	.59	74LS668	1.69
74LS42	.49	74LS151	.55	74LS253	.59	74LS669	1.89
74LS47	.75	74LS153	.55	74LS257	.59	74LS670	1.49
74LS48	.75	74LS154	1.90	74LS258	.59	74LS674	9.65
74LS49	.75	74LS155	.69	74LS259	2.75	74LS682	3.20
74LS51	.25	74LS156	.69	74LS260	.59	74LS683	3.20
74LS54	.29	74LS157	.65	74LS266	.55	74LS684	3.20
74LS55	.29	74LS158	.59	74LS273	1.49	74LS685	3.20
74LS63	1.25	74LS160	.69	74LS275	3.35	74LS688	2.40
74LS73	.39	74LS161	.65	74LS279	.49	74LS689	3.20
74LS74	.35	74LS162	.69	74LS280	1.98	74LS783	24.95
74LS75	.39	74LS163	.65	74LS283	.69	81LS95	1.49
74LS76	.39	74LS164	.69	74LS290	.89	81LS96	1.49
74LS78	.49	74LS165	.95	74LS293	.89	81LS97	1.49
74LS83	.60	74LS166	1.95	74LS295	.99	81LS98	1.49
74LS85	.69	74LS168	1.75	74LS298	.89	25LS2521	2.80
						25LS2569	4.25

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
ST = SOLDERTAIL		
8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80
WW = WIREWRAP		
16 pin ZIF	6.75	call
24 pin ZIF	9.95	call
ZIF = TEXTOOL (Zero Insertion Force)		

CONNECTORS

RS232 MALE	2.95
RS232 FEMALE	3.50
RS232 FEMALE RIGHT ANGLE	5.25
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

7400

7400	.19	74132	.45
7401	.19	74136	.50
7402	.19	74141	.65
7403	.19	74142	2.95
7404	.19	74143	2.95
7405	.25	74145	.60
7406	.29	74147	1.75
7407	.29	74148	1.20
7408	.24	74150	1.35
7409	.19	74151	.55
7410	.19	74152	.65
7411	.25	74153	.55
7412	.30	74154	1.25
7413	.35	74155	.75
7414	.49	74156	.65
7416	.25	74157	.55
7417	.25	74159	1.65
7420	.19	74160	.85
7421	.35	74161	.69
7422	.35	74162	.85
7423	.29	74163	.69
7425	.29	74164	.85
7426	.29	74165	.85
7427	.29	74166	1.00
7428	.45	74167	2.95
7430	.19	74170	1.65
7432	.29	74172	5.95
7433	.45	74173	.75
7437	.29	74174	.89
7438	.29	74175	.89
7440	.19	74176	.89
7442	.49	74177	.75
7443	.65	74178	1.15
7444	.69	74179	1.75
7445	.69	74180	.75
7446	.69	74181	2.25
7447	.69	74182	.75
7448	.69	74184	2.00
7450	.19	74185	2.00
7451	.23	74186	18.50
7453	.23	74190	1.15
7454	.23	74191	1.15
7460	.23	74192	.79
7470	.35	74193	.79
7472	.29	74194	.85
7473	.34	74195	.85
7474	.33	74196	.79
7475	.45	74197	.75
7476	.35	74198	1.35
7480	.59	74199	1.35
7481	1.10	74221	1.35
7482	.95	74246	1.35
7483	.50	74247	1.25
7485	.59	74248	1.85
7486	.35	74249	1.95
7489	2.15	74251	.75
7490	.35	74259	2.25
7491	.40	74265	1.35
7492	.50	74273	1.95
7493	.35	74276	1.25
7494	.65	74279	.75
7495	.55	74283	2.00
7496	.70	74284	3.75
7497	2.75	74285	3.75
74100	1.75	74290	.95
74107	.30	74293	.75
74109	.45	74298	.85
74110	.45	74351	2.25
74111	.55	74365	.65
74116	1.55	74366	.65
74120	1.20	74367	.65
74121	.29	74368	.65
74122	.45	74376	2.20
74123	.49	74390	1.75
74125	.45	74393	1.35
74126	.45	74425	3.15
74128	.55	74426	.85
		74490	2.55

CMOS

4000	.29	4528	1.19
4001	.25	4531	.95
4002	.25	4532	1.95
4006	.89	4538	1.95
4007	.29	4539	1.95
4008	.95	4543	1.19
4009	.39	4555	.95
4010	.45	4556	.95
4011	.25	4581	1.95
4012	.25	4582	1.95
4013	.38	4584	.75
4014	.79	4585	.75
4015	.39	4702	12.95
4016	.39	74C00	.35
4017	.69	74C02	.35
4018	.79	74C04	.35
4019	.39	74C08	.35
4020	.75	74C10	.35
4021	.79	74C14	.59
4022	.79	74C20	.35
4023	.29	74C30	.35
4024	.65	74C32	.39
4025	.29	74C42	1.29
4026	1.65	74C48	1.99
4027	.45	74C73	.65
4028	.69	74C74	.65
4029	.79	74C76	.80
4030	.39	74C83	1.95
4034	1.95	74C85	1.95
4035	.85	74C86	.39
4040	.75	74C89	4.50
4041	.75	74C90	1.19
4042	.69	74C93	1.75
4043	.85	74C95	.99
4044	.79	74C107	.89
4046	.85	74C150	5.75
4047	.95	74C151	2.25
4049	.35	74C154	3.25
4050	.35	74C157	1.75
4051	.79	74C160	1.19
4053	.79	74C161	1.19
4060	.89	74C162	1.19
4066	.39	74C163	1.19
4068	.39	74C164	1.39
4069	.29	74C165	2.00
4070	.35	74C173	.79
4071	.29	74C174	1.19
4072	.29	74C175	1.19
4073	.29	74C192	1.49
4075	.29	74C193	1.49
4076	.79	74C195	1.39
4078	.29	74C200	5.75
4081	.29	74C221	1.75
4082	.29	74C373	2.45
4085	.95	74C374	2.45
4086	.95	74C901	.39
4093	.49	74C902	.85
4098	2.49	74C903	.85
4099	1.95	74C905	10.95
14409	12.95	74C906	.95
14410	12.95	74C907	1.00
14411	11.95	74C908	2.00
14412	12.95	74C909	2.75
14419	7.95	74C910	9.95
4502	.95	74C911	8.95
4503	.65	74C912	8.95
4508	1.95	74C914	1.95
4510	.85	74C915	1.19
4511	.85	74C918	2.75
4512	.85	74C920	17.95
4514	1.25	74C921	15.95
4515	1.79	74C922	4.49
4516	1.55	74C923	4.95
4518	.89	74C925	5.95
4519	.39	74C926	7.95
4520	.79	74C927	7.95
4522	1.25	74C928	7.95
4526	1.25	74C929	19.95
4527	1.95	74C930	19.95

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74S04	.35	74S174	.95
74S05	.35	74S175	.95
74S08	.35	74S181	3.95
74S09	.40	74S182	2.95
74S10	.35	74S188	1.95
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74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.95
74S65	.40	74S253	.95
74S74	.50	74S257	.95
74S85	1.99	74S258	.95
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74S132	1.24	74S288	1.90
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74S134	.50	74S301	6.95
74S135	.89	74S373	2.45
74S138	.85	74S374	2.45
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FND-500 (503)	.5"	CC	.99
FND-507 (510)	.5"	CA	.99

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2N3055	NPN POWER	TO-3	.79	10/6.99
3055T	NPN POWER	TO-220	.69	10/5.99
2N3904	NPN SWITCH	TO-92	10/1.00	100/8.99
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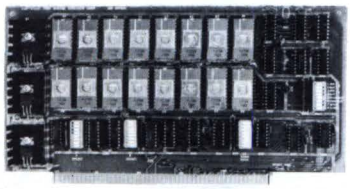
32K S-100 EPROM CARD
PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

64K S100 STATIC RAM

$299.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

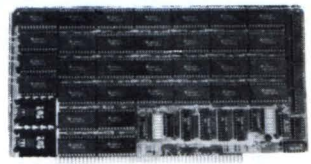
SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $249

ASSEMBLED AND TESTED ADD $40



FEATURES:

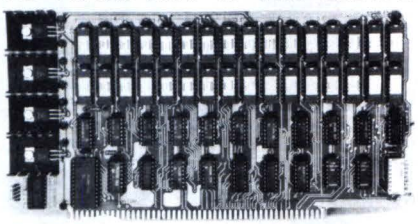
- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$119.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-$33

LOW PROFILE SOCKET SET-$12

SUPPORT IC'S & CAPS-$19.95

ASSEMBLED & TESTED-ADD $35

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM

$219.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

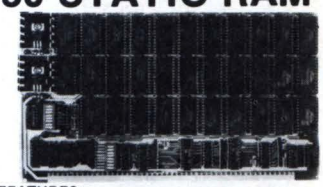
SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $269

64K Kit $319

ASSEMBLED AND TESTED ADD $40



FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

STEREO! S-100 SOUND COMPUTER BOARD

NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

COMPLETE KIT! **$69.95** (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

KIT FEATURES:

- TWO GI SOUND COMPUTER IC'S.
- FOUR PARALLEL I/O PORTS ON BOARD.
- USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- ON BOARD PROTO TYPING AREA.
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! NEW!

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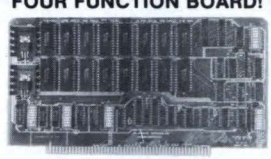
A&T EPROM ADD $35.00



BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- Fully Supports IEEE 696 Buss Standard (As Proposed)
- Supports 24 Bit Extended Adressing
- 200 NS (FAST!) RAM'S are standard on the RAM Kit
- Supports both Cromemco and North Star Bank Select
- Supports Phantom
- On Board wait State Generator
- Every 2K Block may be disabled
- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $169.95
For RAM Kit A&T - Add $40

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **$9.95** **PRICE CUT!**

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32K S100 EPROM/STATIC RAM

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FOUR FUNCTION BOARD!

NEW!

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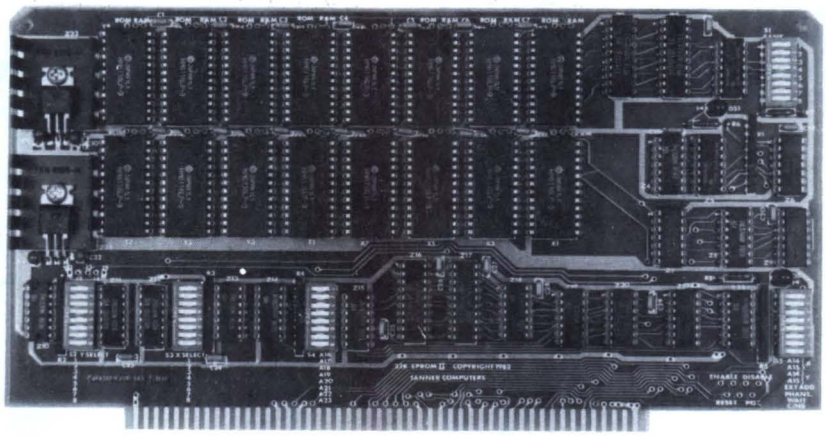
A&T EPROM ADD $35.00



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SUPPORT IC'S PLUS CAPS $23.00

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  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- ★ Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- ★ Meets IEEE 696 Buss Standard (As Proposed)
- ★ Supports 24 Bit Extended Adressing
- ★ 200 NS (FAST!) RAM'S are standard on the RAM Kit
- ★ Supports both Cromemco and North Star Bank Select
- ★ Supports Phantom
- ★ On Board Wait State Generator
- ★ Every 2K Block may be disabled
- ★ Addrssed as two separate 16K Blocks on any 64K Boundary
- ★ Perfect for MP/M* Systems
- ★ RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $169.95

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7406	21	7475	30	74LS08	24	74LS92	65	74LS170	1.55		
7409	18	7476	30	74LS09	24	74LS93	60	74LS174	85		
7410	18	7480	55	74LS08	28	74LS95	90	74LS175	85		
7411	22	7483	1.00	74LS10	24	74LS107	38	74LS190	90		
7412	48	7489	3.90	74LS11	33	74LS109	38	74LS191	90		
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7430	18	74153	40	74LS30	24	74LS136	50	74LS253	80		
7432	25	74144	2.50	74LS32	32	74LS138	65	74LS257	80		
7438	25	74145	90	74LS37	50	74LS139	65	74LS258	80		
7440	18	74148	1.00	74LS38	32	74LS145	1.10	74LS259	1.25		
7442	45	74154	1.00	74LS42	50	74LS147	1.20	74LS260	60		
7443	60	74157	45	74LS48	70	74LS151	70	74LS273	1.50		
7444	60	74160	90	74LS51	24	74LS153	70	74LS275	3.00		
7445	60	74161	80	74LS54	25	74LS157	70	74LS279	90		
7447	60	74166	90	74LS74	35	74LS158	70	74LS283	75		
7448	60	74174	95	74LS75	48	74LS162	85	74LS373	90		
7450	18	74181	1.95	74LS76	38	74LS163	85	74LS374	1.50		
7451	18	74393	1.00	74LS78	50	74LS164	85	74LS377	1.40		
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64K Static RAM $299.95

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6 bit, 8 or 10 MHz 8086 CPU with provisions for 8087 & 0130.

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2/4 MHz Z80A CPU, 24 bit addressing.

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SBC-200 - SD Systems

MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K OM space, monitor PROM included.

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2810 Z-80 CPU - C.C.S.

or 4 MHZ Z-80 CPU with serial I/O port & on-board monitor ROM, front panel compatible.

PU-30400A *A & T with PROM* **$289.95**

2820 Z-80 DMA CPU - C.C.S.

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" or 5¼" DMA disk controller, single or double density, ingle or double sided, 10 MHz.

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Double density disk controller for any combination of 5¼" nd 8" single or double sided, analog phase-locked loop lata separator, vectored interrupts, CP/M 2.2 & Oasis ompatible, control/diagnostic software PROM included.

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High reliablity double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

DD-1200B *Bare board & hdwr man* **$59.95**
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DD-1200A *A & T w/hdwr & sftwr man* **$325.95**
FC-59002001F *CP/M 2.2 with Double D* **$99.95**

S-100 Memory Boards

256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

MEM-65064A *64K A & T* **$474.95**
MEM-65128A *128K A & T* **$574.95**
MEM-65192A *192K A & T* **$674.95**
MEM-65256A *256K A & T* **$774.95**
SFC-55009000F *RAMDISK sftwr CP/M 2.2* **$44.95**
SFC-55009000F *RAMDISK with EXRAM III* **$24.95**

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A *A & T* **$1609.95**
MEM-12810C *CSC* **$1794.95**

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A *64K A & T* **$549.95**
MEM-64180C *64K CSC* **$698.95**

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A *RAM 16 A & T* **$598.95**
MEM-32180C *RAM 16 CSC* **$698.95**

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A *A & T* **$499.95**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A *64K A & T* **$499.95**

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

MEM-99152B *Bare board* **$49.95**
MEM-99152K *Kit less RAM* **$99.95**
MEM-32152K *32K kit* **$199.95**
MEM-56152K *56K kit* **$289.95**
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Assembled & Tested ..... **add $50.00**

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.

MEM-64566A *64K A & T* **$424.95**

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MEM-64633A *64K A & T* **$399.95**

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B *Bare board w/manual* **$49.95**
MEM-99730K *Kit with no RAM* **$179.95**
MEM-32731K *32K kit* **$199.95**
MEM-64733K *64K kit* **$249.95**
Assembled & Tested ..... **add $50.00**

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A *16K A & T* **$149.95**

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A *SS1 A & T* **$359.95**
IOX-1850C *SS1 CSC* **$459.95**
IOX-1855A *with 9511 A & T* **$554.95**
IOX-1855C *with 9511 CSC* **$654.95**
IOX-1860A *with 9512 A & T* **$554.95**
IOX-1860C *with 9512 CSC* **$654.95**

INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A *A & T* **$218.95**
IOI-1810C *CSC* **$288.95**

INTERFACER 2 - CompuPro

3 parallel, 1 serial, & interrupt timer.

IOI-1820A *A & T* **$218.95**
IOI-1820C *CSC* **$288.95**

INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

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IOI-1838A *8 port A & T* **$628.95**
IOI-1838C *8 port CSC* **$749.95**

INTERFACER 4 - CompuPro

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IOI-1840A *A & T* **$314.95**
IOI-1840C *CSC* **$414.95**

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Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

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IOI-1875C *4K MPX CSC* **$534.95**
IOI-1880A *16K MPX A & T* **$584.95**
IOI-1880C *16K MPX CSC* **$674.95**

I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

IOI-1018A *A & T* **$469.95**

I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud

IOI-1015A *A & T* **$289.95**

MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system

IOI-1504A *A & T w/software* **$495.00**

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports.

IOI-1010B *Bare board w/manual* **$35.00**
IOI-1010K *Kit with manual* **$179.95**
IOI-1010A *A & T with manual* **$249.95**

2830 6 PORT SERIAL - C.C.S.

Six asynchronous RS-232C serial I/O ports with programmable baud rates.

IOI-1040A *A & T with manual* **$529.95**

2710 4 PORT SERIAL - C.C.S.

Four RS-232C serial I/O ports with full handshaking.

IOI-1060A *A & T with manual* **$319.95**

2719 2 SER & 2 PAR - C.C.S.

Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.

IOI-1080A *A & T with manual* **$349.95**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Circle 48 on Reader Service card.

Disk Drive for Apple $289.95

Modems

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Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A *Signalman* **$89.95**

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Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A *Smartmodem* **$224.95**
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Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dial,touch & pulse dialing, auxiliary 3-wire RS-232C serial port for printer

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1200 BAUD SMARTMODEM - Hayes

1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.

IOM-5500A *Smartmodem 1200* **$599.95**

1200 BAUD AUTO CAT - Novation

212 Auto Cat, 1200 & 300 baud, auto dial/answer/disconnect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.

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Video Monitors

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15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201 *List price $189.95* **$129.95**

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High resolution color monitor with audio.

VDC-651212 *Color monitor* **$389.95**
NEC-1202D *RGB color monitor* **$999.95**

13" COLOR MONITORS - BMC

18 MHz RGB & composite video color monitors.

VDC-421320 *13" RGB Color* **$329.95**
VDC-421310 *13" Composite video* **$299.95**
VDX-420090 *RGB card for Apple* **$149.95**

COLOR MONITORS - Amdek

Reasonably priced color video monitors.

VDC-80130 *13" Color I* **$379.95**
VDC-801320 *13" Color II* **$894.95**
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ULTRA-VIOLET EPROM ERASERS

Inexpensive erasers for industry or home.

XME-3100A *Spectronics w/o timer* **$69.50**
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Single User System

THREE BOARD SET - SD Systems

4 MHz Z-80A CPU, 64K RAM (optional 256K), serial I/O port, parallel I/O port, double density disk controller, CP/M 2.2 & manual set, system monitor, control & diagnostic software. Includes SBC-200, 64K ExpandoRAM II, Versafloppy II, & CP/M 2.2 - all boards are assembled & tested.

Board set with 64K of RAM **$1095.00**
Board set with 256K of RAM **$1295.00**

Apple II Accessories

APPLE DISK DRIVE - Fourth Dimension

Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

MSM-123200 *40 Track add on Apple drive* **$289.95**
MSM-123200 *Controller with free DOS 3.3* **$99.95**

16K RAM CARD - for Apple II

Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

MEX-16700A *Save over $100.00* **$69.95**

Z-80 CPU CARD - for Apple II

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M and complete manual set.

CPX-62800A *A & T with software* **$249.95**

APPLE-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A *Save $50.00!!!* **$325.95**

8" DISK CONTROLLER - Vista

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible

IOD-2700A *A & T* **$499.95**

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

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1 MegaByte Package *A & T* **$1695.00**
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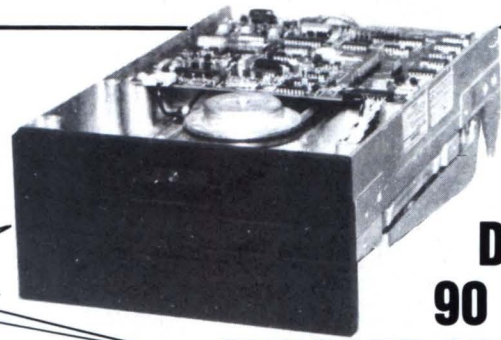

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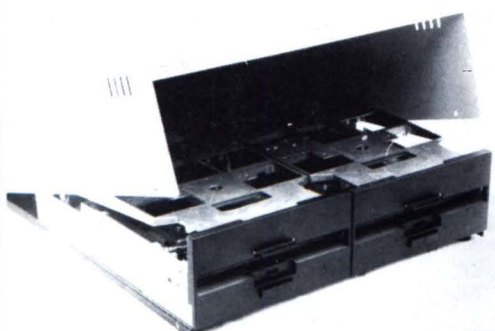

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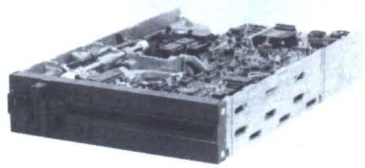

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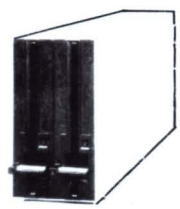

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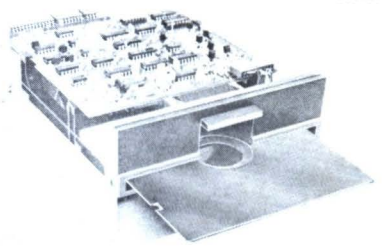
Tracks/Diskette	40
Capacity Per Side (unformatted)Double Density	250KB
Access Time	
Track-to-Track	5 ms
Average	75 ms
Head Settle Time	15 ms
Mechanical Dimensions:	
Width: 5.75 in. **Height:** 3.25 in. **Depth:** 8.00 in.	
DC Voltage Requirements:	+12/+5
Current Requirements	900mA/ 600mA



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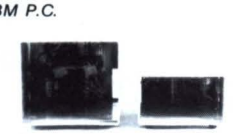
Vista



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74LS221N	1.19	**CMOS**		**INTERFACE**		Z80 S10/2	23.95		
74LS258N	.69	CD4000	.25	8095	.65	Z80A S10/2	28.95		
74LS367N	.69	CD4001	.35	8096	.65	Z80B CTC	15.50		
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LINEAR		CD4006	.95	8212	1.85	74C923	5.50		
CA3045	.90	CD4008	.95	8214	3.75	HD0165-5	7.95		
CA3046	1.10	CD4008	.95	8216	1.80				
CA3081	1.80	CD4009	.45	8224	2.50	**D Connectors RS232**			
CA3082	1.90	CD4010	.45	8228	4.95	DB25P	2.95		
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LM305H	.87	CD4013	.45	8255	4.75	Cover	1.25		
LM307N	.35	CD4014	.95	8257	8.75				
LM308N	.99	CD4015	.95	8259	6.90				
LM309K	1.25	CD4016	.45	8728	.95				
LM311H/N	.64	CD4017	1.05	8797	.99				
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MOS/MEMORY RAM

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2102-1	.85	AY5-1014A/1612	6.95
2102AL-4	1.25	3341	6.95
2102AN-2L	1.65		
2104A-4	4.95	**PROM**	
2107B-4	3.75	1702A	4.50
2111-1	2.99	2532	7.95
2112-2	2.99	2708	3.75
2114	2.24	2716 5 Volt	4.95
2114L 300ns	2.00	2716 5 Volt	4.95
2114L 450ns	1.95	8/2716 5 Volt	29.60
4116 200ns	2.25	2732	6.95
8/4116 200ns	12.40	2758	7.49
8/4116 150ns	18.50	8748	29.95
MM5280	3.00	8755	31.95
MM5321	9.95	N82S23	3.95
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416	2.50	N82S137	8.75
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HM6116-4	6.95	2716-1	8.95
HM6116 LP3	8.95		
4164 200ns	7.25		
MK 4816	24.50	**CONNECTORS**	
		30 pin edge	2.50
CLOCKS		44 pin edge	2.75
MM5311	4.95	86 pin edge	4.00
MM5312	3.90	100 pin edge	3.95
MM5314	3.90	100 pin edge w/w	4.95
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MM5841	14.45	**IC SOCKETS**	
MM5865	7.95	**Solder Tin Low Profile**	
CT7010	8.95	**PIN 1UP PIN 1UP**	
CT7015	8.95	8 13 22 .30	
MM5375AA/N	3.90	14 14 24 .30	
MM5375AG/N	4.90	16 16 28 .40	
7205	16.50	18 20 36 .58	
7207	7.50	20 29 40 .49	
7208	15.95		

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PIN		PIN	
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16	.57	28	1.00
18	.67	40	1.59

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Green, Orange, Yellow Jumbo	25
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(spec: red, amber, green, yellow clear)	

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	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.90
DL747/750	CA/CC	.600	1.49
FND359	CC	.357	.70
FND500/507	CC/CA	.500	.99
FND503/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
10 digit display			1.25
7520 Clairex photocells			.39
TIL311 Hex			9.50
MAN4610	CA	40	.99
MAN4710	CA	40	.95
MAN6640	CC	.56	.99
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Venture

VENTURE is a single board computer that is an adventure for the hobbyist. It is a learning, training computer as well as just plain fun for anyone who wants to get into a state-of-the-art computer at reasonable cost.

VENTURE comes in kit form or fully assembled and tested. You can get it in its minimum configuration for as little as $195.00 or take it all the way to floppy disks and voice. It can be expanded as a kit or fully assembled, at your own pace and choice.

VENTURE is a 16" by 20" main board with separate ASCII and HEX keyboards. It runs fast, almost 4 MHz, and has the capability of putting 1.5 megabyte of RAM and ROM on the board along with a variety of inexpensive options.

A 16-channel analog-to-digital converter allows use of joysticks, control functions, instrumentation, temperature sensing, etc. T1 sound generator, software controlled music, Votrax voice synthesizer and real time clock calendar add to its versatility.

VENTURE connects directly to a monitor or to your TV set through an RF modulator. And now for the heart of VENTURE ... its video display. VENTURE has a high resolution programmable video display with up to 16,384 user-defined characters, alphanumeric symbols, special graphics or objects, such as space ships, etc. Each character is 8 pixels wide by 15 pixels high, with 2 grayscale maps; it has 64 levels of grayscale plus video invert/compliment and hidden screen update for a "snow" free display. The display is 512 x 512 pixel mapped with 2 planes of video RAM per display. VENTURE video is in short ... astounding!

VENTURE has complete software support with full BASIC, 3 ROM monitors, disassembler/assembler/editor. It will run real-time video games, all RCA chip 8 programs and all current Quest 1802 software. VENTURE DOS will accommodate up to four 5¼" double density floppies. A complete 1802 programming book is available. All versions of VENTURE are shipped with a set of manuals written to be understood by the inexperienced as well as experienced user.

A standard 60-pin bus with 5 slots, parallel ports and 2 serial ports with full handshaking (75 to 9600 BAUD) allow expansion into floppy disks, color, EPROM programmer, printer, model of your choice. Later expansion will add a light pen, a universal user programmable music sound board, General Purpose Instrument Bus, and a high resolution color/grayscale pixel mapped video board.

On-Board Options

16 channel A to D; 5 slot 60 pin bus, 2 serial ports, parallel ports, 4 video options incl. color, 48K RAM, Votrax voice synthesizer, sound generator, EPROM, full BASIC disassembler, editor, assembler, metal cabinet, additional power supply, ASCII keyboard real time clock calendar.

Expansion Options

Floppy disk, EPROM programmer, light pen, universal user programmable music, sound board high resolution color/grayscale pixel mapped video board. General Purpose Instrument Bus, 8088 co-processor board.

Minimum VENTURE System $195.00

Kit includes CPU and control with 4K of RAM, 1K of scratchpad, 2K monitor, 1861 video graphics, cassette interface and separate HEX keyboard with LED displays for address and output. Power supply is included along with 2 game cassettes. The main board is 16" x 20" and includes space for all of the previously discussed on-board options. Full on-board expansion can be completed for under $1000.00. Call for further details, option prices, etc.

RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a tremendous value as it combines video, digital displays, LED displays, and music, all on a single board for $106.95.

The Super Elf expansion capability is virtually unlimited and you can do it inexpensively one step at a time. Expansion includes casstte interface, additional memory, color video, Basic, ASCII keyboard, printer, floppy, S-100 bus, RS232, etc.

The Super Elf comes complete with power supply and detailed 127 page instruction manual which includes over 40 pages of software, including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D. A monthly newsletter. Questdata is devoted exclusively to software for the Super Elf and there are many software books available at low cost.

The Super Elf computer system is now available as a series of bare boards as well as full kits and assembled.

Bare Boards: Super Elf $35.00. Super Expansion $35.00. Power Supply $10.00. S-100 Color $35.00. Dynamic RAM $40.00. Manuals $10.00. Super Basic $45.00.

"Eat & Run" cassette $14.95

Free 14 Page Brochure

Send or call for a free brochure on all details and pricing of the Super Elf and its expansion. We will get it right out to you!

Voltage Mate $18.50

$1.25 shipping. Switching regulator kit with adjustable AC/DC voltage conversion. 3 modes of operation; step up, step down, inversion. Jumper selectable modes of operation. Input voltage 5-15 VDC, output voltage −24 to +30 VDC, current draw 30–250 ma.

UHF Preamplifier Kit $34.95

$2.00 shipping. Improves uhf reception dramatically, 25 db gain assem. version **$57.50.** Articles Radio Elect. Mar, May, 1981.

Fluke Multimeters

D800 $125.—D802 $189.—D804 $249.

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor; fully expandable. **$439.00.** 4K version **$454.00.** 4K Assembler **$35.00,** 8K Basic Interpreter **$65.00.**

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***Send for complete list of all AIM products.**

Super Color S-100 Video Kit $99.00

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: *Send for excellent pricing/margin* program.**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Apple Peripheral Kits

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APPLE II GAME PADDLES Adam and Eve **$38.00.**

16K RAM Board to take you to 64K. Assem. **$67.** Kit **$57.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

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Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$83.00** (with timer **$119.00**).

Z80 MicroProfessor $135.00

Single board computer. Learning, teaching, prototyping. 2K RAM, keyboard, displays; cassette interface. Tiny BASIC **$19.00.** All fully assembled.

Z80 Microcomputer Kit $69.00

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$79.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June, July, Aug. *Radio Electronics*, 1981.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

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Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$59.00.**

Direct Connect Modem $99.00

Fully assembled in case with RS232 cable. Orig/answer, 103 compatible, 9V battery or wallplug.

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our 1982 QUEST CATALOG. Include 88¢ stamp.

Circle 44 on Reader Service card.

READER SERVICE

This card valid until January 31, 1983

My vote for the best advertisement in this issue goes to _____(company) whose Reader Service number is _____.

A. What microcomputer system(s) do you own? Check all that apply
- ☐ 1. Apple II
- ☐ 2. Apple III
- ☐ 3. Atari 400
- ☐ 4. Atari 800
- ☐ 5. DEC
- ☐ 6. Heath H8
- ☐ 7. Heath H89
- ☐ 8. Heath Z/90
- ☐ 9. Hewlett-Packard
- ☐ 10. IBM PC
- ☐ 11. Osborne I
- ☐ 12. OSI
- ☐ 13. PET
- ☐ 14. PMC-80/81
- ☐ 15. S-100 based system. Which one? _____
- ☐ 16. Sinclair ZX-80
- ☐ 17. Sinclair ZX-81/Timex 1000
- ☐ 18. TI 99/4 A
- ☐ 19. TRS-80 Mod I
- ☐ 20. TRS-80 Mod II
- ☐ 21. TRS-80 Mod III
- ☐ 22. TRS-80 Color
- ☐ 23. TRS-80 Pocket
- ☐ 24. VIC-20
- ☐ 25. Other (specify)_____
- ☐ 26. Don't yet own one

B. Would you purchase your next computer from the same manufacturer?
- ☐ 1. Yes
- ☐ 2. No

C. Are you currently using CP/M on your system?
- ☐ 1. Yes
- ☐ 2. No

D. What types of software have you purchased during the last year?
- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Game
- ☐ 4. Utility
- ☐ 5. Business
- ☐ 6. Home Finance/Household
- ☐ 7. Education
- ☐ 8. Scientific
- ☐ 9. Other (please specify)_____

E. What types of software do you plan to purchase during the next year?
- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Game
- ☐ 4. Utility
- ☐ 5. Business
- ☐ 6. Home Finance/Household
- ☐ 7. Education
- ☐ 8. Scientific
- ☐ 9. Other (please specify)_____

F. Where do your children use computers?
- ☐ 1. Home
- ☐ 2. School
- ☐ 3. Both
- ☐ 4. Don't use computers

G. What peripheral equipment have you purchased during the last year?
- ☐ 1. Printer
- ☐ 2. Plotter
- ☐ 3. Floppy disk drives
- ☐ 4. Hard disk drives
- ☐ 5. Expansion interface
- ☐ 6. Modem
- ☐ 7. Monitor
- ☐ 8. Other (please specify)_____

H. What peripheral equipment do you plan to purchase during the next year?
- ☐ 1. Printer
- ☐ 2. Plotter
- ☐ 3. Floppy disk drives
- ☐ 4. Hard disk drives
- ☐ 5. Expansion interface
- ☐ 6. Modem
- ☐ 7. Monitor
- ☐ 8. Other (please specify)_____

I. What low-end computer system(s) are you considering buying?
- ☐ 1. Commodore VIC
- ☐ 2. Commodore Max
- ☐ 3. Sinclair Spectrum
- ☐ 4. Sinclair Spectrum
- ☐ 5. ZX-81/Timex 1000
- ☐ 6. Atari 400
- ☐ 7. TRS-80 Color Computer

J. What is your annual household income?
- ☐ 1. Under $20,000
- ☐ 2. $20,000-$40,000
- ☐ 3. $40,000-$60,000
- ☐ 4. $60,00-$80,000
- ☐ 5. $80,000-$100,000
- ☐ 6. Over $100,000

K. I have stopped subscribing to the following publications:
- ☐ 1. Byte
- ☐ 2. Compute
- ☐ 3. Creative Computing
- ☐ 4. InfoWorld
- ☐ 5. Interface Age
- ☐ 6. Personal Computing
- ☐ 7. Popular Computing
- ☐ 8. Softalk
- ☐ 9. Other _____

vertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on one of the cards on this page, include your name, address & zip, and drop in a mailbox. In 4–6 weeks you'll hear from the advertiser directly.

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Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

OSI C1P with SEB hires color graphics/memory board, RS-232, high-speed cassette, dual joysticks, OSI b/w monitor, Electronic Systems modem board, game programs, extensive documentation—$990. Must sell for college. Sean Weist, 1000 East 5th St., Fowler IN 47944.

For sale: SS-50, 6800-6809 equipment and software. Send SASE for list. Roy Hawkins, W. 341 S. 5065 McCoy Parkway, Dousman, *WI 53118*.

ZX81/TS1000 Users: Free newsletter and software available from Z-WEST User's Group. No SASE, no money—just your name and address. Write us at PO Box 2411, Vista, CA 92083.

Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

MICRO QUIZ

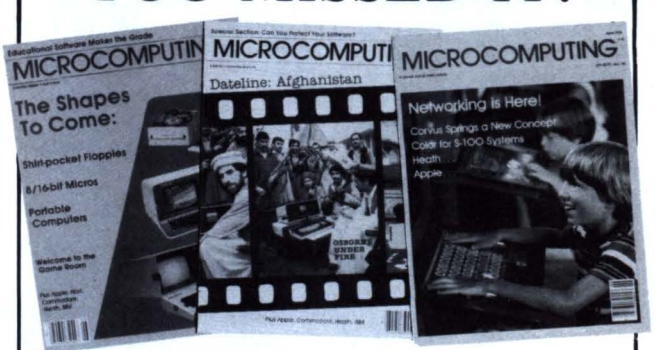
Analysis of Algorithms

How many times is "MICRO" printed during the execution of the following program?

```
10 FOR I = -5 TO 5
20 IF ABS (I) <= 2 THEN GOTO 60
30 FOR J = (I+5) TO (I*I) STEP 2
40 IF I*J<= 0 THEN PRINT "MICRO"
50 NEXT J
60 NEXT I
```

(answer on page 88)

YOU MISSED IT!



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LETTERS TO THE EDITOR

FUTURE VALUE SUMMARY

Assumed interest rate per period 10%

CASH FLOW DETAIL

Period Number	CASH FLOW Amount	NO. OF CONSECUTIVE Similar CASH FLOWS
1	– 1000	1

Future Value = $ 1,000.00 (T = 0 in line 610)

FUTURE VALUE SUMMARY

Assumed interest rate per period 10%

CASH FLOW DETAIL

Period Number	CASH FLOW Amount	NO. OF CONSECUTIVE Similar CASH FLOWS
1	– 1000	1

Future Value = $ 1,100.00 (T = 1 in line 610)

Table 1. Changing line 610 of The Future Value of Cash Flows program (Microcomputing, September 1982) from T=0 to T=1 will provide the value shown in second Future Value Summary.

Error in Program?

Perhaps there is an error in line 610 of Joe Najjar's Cash Flow program ("Micro Money-Maker," September 1982, p. 62).

Changing the program from T = 0 to T = 1 will provide the correct future value as in Table 1.

E. Stanton Maxey, M.D.
Stuart, FL

Reply:

Line 610 in my program is correct. I have verified the accuracy with HP12C, HP38E and TI Business Analyst financial calculators.

Business investments and financial models generally assume cash flows into and out of investments at the end of each period. Accordingly, in Dr. Maxey's first illustration, if $1000 was invested at the end of the period in an account which paid 10 percent interest per period, no interest would have been earned.

If the change Dr. Maxey suggests is made (change line 610 from T=0 to T=1), the program would then assume that all cash flows into or out of the investment occur at the beginning of the period. Readers should be cautioned that his assumption is unconventional.

Joseph N. Najjar III
Westwood, MA

Keep RPL Info Coming

Thank you for your recent article "What You Didn't Know About NEC Spinwriter," (October *Microcomputing*, p.32), describing RPL and Spinwriter graphics. I hope you will continue to find ways like this to cover RPL.

The program listings and descriptions of them were most helpful. Although I have played around with RPL, I learned more about how to use its power by studying the way it was used in these listings than I ever would have on my own. It's the old mentor-protege thing; perhaps most of us learn best by imitation.

Illustrations showing RPL code using resident machine-language subroutines that drive IEEE devices other than printers, or that expand or depend upon other Basic features, would be especially useful. For example, using RPL, how do you access a random record in a 4.0 relative file? Or, how could RPL use "Supersort" or "Bulletproof" machine-language utilities that manipulate Basic arrays?

Nelson R. Murphy
New York, NY

Looking for PROMS

My micromatic-80 printer system, which utilizes IBM's 1980 terminal with its interface and was regularly advertised in your magazine in 1979 and 1980, has started to print alphabet F instead of B whenever I try to print B from my TRS-80 Model II computer.

A local technician said one of two PROMs in the interface is not working correctly, but he has no program to fix it. The company is apparently out of business, because their phone is disconnected and my telegram was returned undelivered.

I am wondering if anybody out there could help me find the PROMs for the interface.

Walter Park
West O'Brien Drive
Agana, Guam, MI 96910

Wayne Green Is Right

In one of your publications you rightfully pointed out that IBM failed to keep up with innovations in the field of typesetting. Having been using this IBM Electronic Composer for the last five years or so, I am quite aware of its strong and weak points. I would dearly like to advance to technologically more advanced equipment without spending a minor fortune buying a photo-typesetter. So what else is available? You didn't mention any alternatives in your editorial!

The motivation, however, to write this letter was your editorial in the August issue of *Microcomputing* (p. 6) under the heading of "The Key to Wealth."

Based on personal experience, I couldn't agree more with your basic thesis regarding the "weeding-out" of "troublemakers" in the major corporations: those who display a modicum of initiative, new ideas and even (horror) intelligence. But, in further confirmation of your message, when I finally realized the truth and left a rather high and well-paying corporate position, embarking upon a personal venture, I almost went bankrupt after four years of exciting but futile struggles. You see, I was running my personal business with the mentality of a manager of a major subsidiary of one of those multinationals. That episode started 12 years ago.

It took me another four years or so to realize that my education in a given profession, plus two decades advancing on the corporate ladder, have constituted a loss of time. Well, perhaps not a total loss of time, for surely I have picked up some useful knowledge along the road, but certainly a considerable loss.

A personal business is a completely different ball-game, requiring that the own-

CALENDAR

Robotics Satellite Seminar

A seminar providing an overview of robotics, current applications and a look into the future will be offered on December 7 by the Institute of Electrical and Electronics Engineers.

The seminar will be televised nationwide from South Carolina, but telephone hook-ups will allow participants to interact with the instructors, who will be addressing a live class.

For further information, call Ms. Jahn Hargrove at 201-981-0060, extension 329.

Computer and Office Equipment Show

Computer Expositions, Inc. announces the Southeast Computer Show and Office Equipment Exposition, scheduled for December 9–12 at the Civic Center, Atlanta, Georgia.

For information, call 1-800-368-2066.

COMDEX/FALL Conference and Exposition

The fourth annual COMDEX/FALL conference and exposition for independent sales organizations is scheduled for November 29–December 2 at the Convention Center in Las Vegas, NV.

The conference will feature a ten-session Computer Retailing Institute, and a plenary session will offer presentations from national mass merchandisers now entering the small systems marketplace.

About 1000 computer and computer-related companies are expected to exhibit.

For further information, call Peter Young or Janet Taylor at 800-225-4620 or (if in Massachusetts) 879-4502.

Computers in Science

A conference on computer technology's influence on future scientific research will be held December 6–9 at the Conrad Hilton Hotel in Chicago. The conference is sponsored by Science Magazine in cooperation with Scherago Associates.

Specific lecture and presentation topics will focus on hardware developments, the interaction of scientists with computers and the influence of computers on how research is conducted. An exposition of computer applications in science will accompany the conference.

For information contact Edward Ruffing, Scherago Associates, 1515 Broadway, New York, NY 10036, 212-730-1050.

Seminar on American Bell's Net 1000

Technology Transfer Institute announces the first authoritative seminar devoted to American Bell's Advanced Information Systems (AIS) Net 1000 service. This will take place in New York City December 6–8.

For further information on the seminar, call Technology Transfer Institute, 741 10th Street, Santa Monica, CA 90402, 213-394-8305.

Exhibition on High-Technology Electronics

Electronic Conventions, Inc. announces that the Midcon/82 High-Technology Electronics Exhibition and Convention will take place November 30–December 2 at the Dallas Convention Center, Dallas, TX.

For further information contact Eileen Algaze, Communications Coordinator, at 213-772-2965.

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Glenview, IL

Software only! Chicagoland's first software store carries software for most major brands of computers. Business, educational, programming aids, entertainment. Special orders our specialty. **The Software Store, Inc., 1767 Glenview Rd., Glenview, IL 60025. 724-7730.**

Freehold, NJ

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Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

er be a "jack of all trades," and preferably a master of some. For those of us who have graduated from a corporate career to a personal business, this is the most difficult hurdle to overcome.

Yet, the modern jack of all trades must be literate in the field of computing or be wealthy enough to hire an assistant thus endowed. Otherwise, he will linger in the backwater until final failure.

Finally, I ask myself: "How many bright, young graduates are really willing to sacrifice the guaranteed stability of a major corporation (provided he or she doesn't rock the boat) in exchange for a personal business?"

But it is not only the risks (current statistics would seem to guarantee that most incipient entrepreneurs will soon go bankrupt), but also the lack of diversified basic preparation. A graduate of a business school is thus much better off sticking to the mediocre parameters of corporate life.

It is only in the case of the select minority that can transcend the aforementioned handicaps, that I would endorse the terms of your editorial. But to those who feel they pertain to such a minority, I can only say "Wayne Green is right!"

Oswald Herring
Caracus, Venezuela

Reply:

There's much in what you say about time spent in large corporations being wasted as far as pursuing a career towards getting rich is concerned. The experience gained with large firms is too narrow to be of much value . . . and, yes, I've worked for some large firms . . . if you call General Electric large.

Typesetting? The state of the technical art is in flux right now. We were all set to spring about a third of a million on a new Bedford typesetting system, but got scared off after sending a team up to their plant to study it in detail. We may try another look at it in a year or two and see if it seems more dependable. Meanwhile, we're making do with a few added Compugraphic systems and a lot of overtime . . . **Wayne.**

Speaking of Speech Output

We need good quality speech output for educational computing . . . now. Vocal responses are a necessity in special education for students with reading difficulties. Foreign language departments want accurate pronunciation examples for students to imitate during computer assisted instruction. Primary and intermediate level grammar school students often have listening vocabularies which are superior to their reading vocabularies. Therefore, these young students will not benefit from the full potential of computer assisted instruction if their best mental resources—listening abilities—aren't tapped.

What is the "state of the art" for adding spoken responses to computer programs? There are two key factors to consider: analog versus digital sound and sequential versus random access.

First, we can use a standard tape recorder. By pressing the play button and controlling the motor with our software and peripheral port, we can have limited voice output. We are now able to program the equivalent to a sequential spoken response file with an option to skip responses. We have an easily programmed, reasonably priced and good quality vocal response to accompany our software.

Unfortunately, the user will be asked to remember to press the play button on the tape player at the correct time. Furthermore, if we want to provide multiple responses, the user will have to wait while the tape player slowly skips inappropriate responses and advances to the intended response.

Second, we can buy one of the speech synthesis units on the market. Once we get the unit hooked up, we have the equivalent of a random-access spoken response. Yet we will need more time to connect it to our system and will spend more energy filling our response file. More importantly, we will lose a great deal of voice quality in many instances. Also, the cost of speech synthesis components will significantly reduce the number of people who can benefit from our programs.

The problem is that industry seems to be ignoring or missing some of the alternate ways the existing technologies could be combined for the user's benefit. The computer and electronics industries are advertising speech synthesis chips for voice output. This may be the most promising approach in the long run but we need better speech output methods while we are waiting for the needed improved software and quality innovations.

Easily programmed and high-standard voice output for microcomputers can exist and will service an untapped market. The life span of this short-term approach will be based on the time it will take technology to provide better alternatives. These innovations may take more time than people anticipate; I remember predictions about language translation functions of microcomputers and bubble memory advances. These innovations proved to be more challenging than were expected.

The third approach is simply to provide remote-controlled tape recorders aimed at the home and educational microcomputer owners. The existing computer-compatible tape-recorder schematics could easily be modified to include solenoid type switches for play, fast forward, rewind and record. Additionally, user-friendly peripheral cables and instructions would be valuable options. If companies can produce a device along these lines that costs under $150 and is compatible with the majority of microcomputers, they would find a ripe market of educational and home computer users. At the same time, we users would benefit greatly while we are waiting for high-quality speech chips and/or affordable equipment for recording digital sound on disks.

Bob Sullivan
Oak Park, IL

P128: 8088 Compatible?

I rely on the ten or so computer publications I read each month to provide me with factual information regarding computer hardware and software. However, from time to time, I run into conflicting reports on a piece of hardware. Such was the case when reading Robert Baker's PET-pourri column in the October issue. In discussing Commodore's new P128, B128 and BX256 computers, Mr. Baker states that the P and B series computers will not be compatible with the 8088 coprocessor standard in the BX256. I have read quite a few reports that say the opposite—both machines offer expansion to 16 bits with an add-on 8088 board.

This both confuses and distresses me. I have pretty much narrowed my choice in computers down to the Commodore 64 and the P128. Until now I have been leaning towards the P128 due to its additional 64K or RAM, the better keyboard, faster 6509 processor and the ability to add the 8088 in the future (when more software is available). These extra features seemed well worth the small ($400 list—probably $300 discounted) difference in price between the two machines.

Since I have yet to receive printed matter on the P128 requested directly from Commodore, I would appreciate your clearing up this discrepancy. Who is right regarding the 8088 add-on?

Philip De Mayo Jr.
Hamden, CT

Reply:

The original press releases stated that the P and B series computers would not accept the 8088 processor board, only the Z80. The latest color brochure, however, does state that they will accept 8088 and Z80 processors as options. Since it is not yet in production, I really wonder which is correct. (Well, Commodore, which is it?—eds.)

Bob Baker
Atco, NJ

Teach Teachers a Lesson

In the 18th century there was a notorious pirate by the name of Edward Teach. And today, a significant amount of soft-

ware piracy is being committed by people who teach. This is not to condemn all teachers, of course. But some of them violate program copyrights by making many duplicates of programs. These illegal copies are either given to students or traded to other teachers and schools, possibly in exchange for other pirated material.

Not only does this discourage the production of educational programs, but it also sets a bad example for students. When they see what their teacher is up to, is it any wonder students themselves sometimes become pirates, perhaps selling the copied programs?

I suggest the following methods of combatting program piracy in schools:

1) On disks or cassettes containing copyrighted programs, software companies should use labels printed in two or more colors. Labels should also be professionally printed, perhaps including a logo, in a print style that cannot be duplicated by ordinary computer printers. Thus, pirated disks and cassettes will be obvious.

2) One extra colored label should be supplied with each program disk or cassette. This will allow a backup copy to be identified with the company label. This label might include the words "company-approved copy."

3) Software companies should state in their advertisements that they use multicolor labels. They should also offer a reward to any person reporting use of any of their programs with homemade labels. Students interested in computers will read the magazines containing the advertising and many of them will welcome an opportunity to stop piracy, especially when they realize that the offense discourages production of further educational programs.

4) The high school principal or college president should be informed of a reported violation and asked to investigate. The reward should be paid when the teacher admits his guilt. (If 20 or 30 students know the pirated program is in use, it will be difficult for the teacher to deny it.)

5) If the school principal or college president does not take action, a complaint should be made to the city or state Department of Education.

6) If any teacher is a repeat offender, the State Department of Education should be asked to revoke his teaching credentials on the grounds of criminal conduct. A software company might also wish to bring suit. This will be simple once the teacher has admitted his guilt.

Of course, no teacher should be directly accused simply on the basis of a student's allegation. Complaints should be made in some such form as the following, "A student has reported that . . . ."

This procedure should also cut down use of pirated programs by business firms.

John Wilson
Felton, CA

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Edited by Larry Canale

A Tool for Scientists and Engineers
Expand Your System
Step into Micro Interfacing
Discover the 68000 Chip
Programs to Aid the Executive

Basic Programs for Scientists and Engineers

Alan R. Miller
Sybex, 1981
2344 Sixth St.
Berkeley, CA 94710
Paperback, 318 pp., $14.95

The title shouldn't limit the readership of this text. The book has value not only for scientists and engineers but also for students of statistics and the Basic language itself. And it's an outstanding review, whether you've been out of school for a few years or a few decades.

Basic Programs for Scientists and Engineers isn't a book on how to program in Basic, but the reader still can learn advanced programming techniques from it. It is not a text in mathematics, but the reader can enhance his understanding of mathematical topics. And as a math refresher course for us old-timers who happen to know some Basic, it is, simply, superb.

Author Alan Miller's intent is to aid the computerist's development and proficiency in the use of Basic and to provide a library of programs and subroutines for solving problems encountered in science and engineering.

While most of Miller's audience probably has access to canned program packages for solving some or all of these problems on large time-shared computers, this book will provide similar routines that can run on any of the Basic-equipped microcomputers. And in the process of getting the programs plugged into and running on a microcomputer, the reader will be gaining insight on how the programs accomplish their tasks.

Evidence of the fact that these routines are kept simple enough for the smallest microcomputers is the plotting package included. For simplicity, the dependent variables are plotted along the horizontal axis, making everything look sideways. But the reason for this is explained; the plots can be made on any alphanumeric-only video or printing terminal. This keeps things compatible with even the smallest microcomputers.

The programs and subroutines included range from the calculation of mean and standard deviation through linear and non-linear curve-fitting to Gamma and Bessel functions. They're presented one at a time, explained briefly and programmed with non-overlapping line numbers so that any or all can be combined into a larger program. A handy map of functions vs. line numbers is included in the introduction; it's a lesson in structured programming in itself.

There are so many lessons to be learned from *Basic Programs for Scientists and Engineers* that it's hard to mention all of the covered topics in a short review. Along with those mentioned above are solutions to simultaneous equations, sorting data, numerical integration and advanced applications.

Starting it all off is a chapter on how to evaluate your Basic for hidden bugs and sources of potential errors. Yes, there are some, and Miller shows you how to find them so they won't sneak up and bite you later.

While this is not a primary text in math or programming, the author has drawn on a decade and a half of experience in teaching programming methods to engineers to produce a readable, understandable text. *Basic Programs for Scientists and Engineers* can be used stand-alone to develop your programming proficiency once you have the basics of the Basic and the math behind you.

Ken Barbier
Borrego Springs, CA

Computer Peripherals That You Can Build

Gordon W. Wolfe
TAB Books, Inc., 1982
Blue Ridge Summit, PA 17214
Softcover, 264 pp., $19.95

The personal computer user who wants to expand the capabilities of his system would do well to invest in *Computer Peripherals That You Can Build*. The book's easy-to-follow discussions are helpful to users of the Apple II, PET, TRS-80, SS-50, S-100 and most other systems.

The scheme of the book is unique. A general-purpose parallel interface is described in detail for each of the popular computers mentioned above; the peripherals that can be built are connected to each computer's interface. Each project uses readily-available parts; most of the projects cost less than $50 to build.

Programming of the interface and peripherals is presented in a logical block-diagram format that includes flowcharts to assist the reader in tailoring the software to specific systems. This book—and a little work—allows the computer user to choose peripherals that do the work needed, not just those that fit a particular system.

Computer Peripherals That You Can Build, which was written assuming the reader has a basic knowledge of electronics and computer programming in machine language, is divided into two parts.

The first half gives background information about digital electronics, computers and decoding, and describes the construction and programming of the universal parallel interface.

The balance of the book describes construction of the peripherals themselves.

One chapter details devices connected directly to the parallel interface; these devices include switches, keyboards, counters and printers. Control of devices such as LEDs, optocouplers, relays, paper tape readers and motors is also covered.

Another chapter discusses the connecting of parallel interface to analog signals. Both digital-to-analog and analog-to-digital conversion is covered. Topics include the programmable volt-

age source, servo control, programmable function generator, music generator, computer graphics, X–Y plotters, joysticks, voltage measurement, real time and multi-tasking.

The last chapter discusses the use of the parallel interface used with serial peripherals. Data storage and retrieval on cassette tape, hardware random number generation and household control over home wiring is covered. The author also includes a discussion of a simple RF modulator that allows an ordinary TV set to be used as a monitor or the conversion of a TV into a computer monitor.

Computer Peripherals That You Can Build is a worthwhile investment for anyone interested in expanding his computer power at a reasonable price.

Dennis Doonan
Racine, WI

Microprocessor and Microcomputer Interfacing

Edward J. Pasahow
Gregg/McGraw-Hill, 1981
Princeton Road
Heightstown, NJ 08520
Softcover, 232 pp., $10.95

Microprocessor and Microcomputer Interfacing is the second of two books by Edward J. Pasahow designed for use in a post-secondary electronics technician training course. This current text maintains the high standards of the first book, *Microprocessors and Microcomputers for Electronics Technicians*, and would give the student a thorough understanding of software and hardware requirements of microprocessor input/output, interface circuitry and signal flow. There also is a section on the use of software in failure analysis.

Pasahow's new book, like its predecessor, is not for the beginning student. The material presented is technical; a previous knowledge of integrated circuits, basic electronics and the 8080A system is assumed. The text is well-written and the technical aspects of interfacing are explained in a clear, step-by-step format.

Each chapter includes an introductory description of the technical data that will follow. At the end of each subsection in each chapter, several review questions are offered; they help to break the chapters into more manageable sections and at the same time give the student a chance to reexamine the information. With the type of technical data this book covers, review and reiteration are important.

A chapter summary in outline format is included at the end of each chapter. The summaries are followed by a section of key terms and concepts which the student can use as a vocabulary list for further study. Finally, there are chapter experiments dealing with interfacing, programming, parallel I/O, the standard types of interfacing, buses and digital-to-analog interfacing.

The laboratory experiments listed after each chapter require electronics equipment. All experimentation is linked to the use of a microprocessor training computer. This wouldn't be a problem for any school that considers using the book, but could present a cost problem for an individual. The laboratory exercises are an integral part of the course, and the hands-on experience is essential to learning this type of material.

All of the book's topics are treated in a concise and easily-understood manner, with well-planned diagrams, figures and tables. It makes a subject that could be tedious for some students readable. At the same time, the chapters feature in-depth coverage.

For example, chapter four, which covers parallel I/O, begins by explaining different I/O concepts. Accumulator and memory-mapped I/O are discussed, followed by an in-depth coverage of accumulator I/O with 8080A I/O instructions, which are described with timing diagrams and before-and-after examples of

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the program counter, registers and memory. The use of buffers is explained and the 8212 I/O port is diagrammed in detail with some emphasis given to the use of this chip as a port. Next, interrupts are covered, from interrupt handling instructions and process timing to the programming of the 8259 priority interrupt control unit.

The last portion of the chapter is a thorough discussion of direct memory access. The process itself is explained and the 8257 DMA Controller is used as a practical exercise. Detailed circuit diagrams and examples of programming the 8257 give the student a clear picture of the use of this interface technique.

Microprocessor and Microcomputer Interfacing, a good companion volume to Pasahow's first book, will give the electronics technician student an appreciation of interfacing in the micro world. As with the first edition, the soft-bound price of $10.95 will appeal to today's student.

And when the student has finished a course using both of these books, he or she should have a comprehensive understanding of the 8080A system and an excellent stepping stone to the growing market for computer technologists.

Lee Syer
Blacksburg, VA

The 68000 Microprocessor Handbook

Gerry Kane
Osborne/McGraw-Hill, 1981
630 Bancroft Way
Berkeley, CA 94710
Softcover, 200 pp., $6.99

It's been said that mankind is doubling his knowledge every five years. Recent advances in electronics prove that this indeed may be the case.

For those computerists who like to stay on the razor's edge of technology, the *68000 Microprocessor Handbook* is certainly a book to consider.

The wave of the future for microcomputer users is in the use of 16-bit microprocessors instead of eight-bit chips. There are several 16-bit microprocessors on the market; this book gives a comprehensive discussion on one of the latest integrated circuits to join the ranks—the Motorola 68000.

The 68000 Handbook is rather short, containing seven chapters and 113 pages of text. But it explores such subjects as timing and bus operations, addressing modes, the instruction set, interfacing with peripherals and a functional overview of the chip.

Much of the book is dedicated to technical information regarding the hardware itself. The coverage includes timing diagrams, electrical specifications and pin and signal assignments.

To enable programmers at least to begin writing programs, the book offers an instruction set. While the book isn't designed to teach machine-language programming, we would like to have seen at least a few sample assembly-language listings.

Author Gerry Kane assumes the reader is familiar with machine-language programming, and that he understands program counters, interrupts, addressing, index registers and stack operations. And some knowledge of assembly-language programming—on any type of microprocessor—is necessary to take advantage of the instruction material presented here.

Some knowledge of assembly-language programming is necessary to take advantage of the instruction material presented here.

The appendix lists in detail the instruction set, along with instruction object code tables and data sheets. Kane also presents a two-page comparison between the MC68000 and other available 16-bit microprocessors, including the 8086 and Z8000.

While *The 68000 Microprocessor Handbook* is not a book for the person who wishes to get into writing a set of object codes, it more than adequately covers the 68000 microprocessor.

Dan Keen
Dave Dischert
Cape Mary Court House, NJ

Executive Planning with Basic

X.T. Bui
Sybex, 1982
2344 Sixth St.
Berkeley, CA 94710
Softcover, 200 pp., $12.95

I'm an incurable book reader and a microcomputer enthusiast, so I'm always picking up books on Basic programs searching for something worthwhile for my computer. But the books usually include only games (not my major interest for the computer—if I want to play I have golf clubs) or they include poorly-written programs for home budget management (for example, a record-keeping program with all the data put in data statements rather than files).

However, my first look at *Executive Planning with Basic* indicated that this book may have some useful programs.

The book breaks down programs into five areas. The first of these is Decision Models Under Certainty, which includes a cost-volume-profit model (breakeven point), a linear programming model (the simplex method) and an inventory management model (economic order quantity).

The section on Decision Models Under Uncertainty includes a decision tree program, a program for critical path analysis and PERT, and a simulation model for optimal queueing.

The section on Forecasting Models includes a moving averages program, an exponential smoothing program, a linear regression program and a multiple linear regression program. The Investment Models section includes a financial ratio analysis program, a discounted cash flow model and a portfolio management program.

The final section is titled Multicriteria Decision-Aid Model.

The forward to *Executive Planning with Basic* states that all programs have been run and tested on an Apple II computer and on the Ohio Scientific C-1P and C-4P microcomputers, but I was able to adapt the programs to a Commodore 8032 computer without much difficulty.

Input for all the programs uses the keyboard, and output is to the screen (no printer output). This tends to eliminate most of the differences between the computer implementations. The programs also tend to avoid device-dependent items—such as clear screen commands.

Each program has an introductory section with the program title, date written and a list of the variables used.

While the programming methods are fairly consistent from program to program, there are enough idiosyncrasies to suggest that they were written by more than one person. Also, there are some minor anomalies in individual programs themselves; for instance, a defined function for rounding is used for only some of the possible occurrences within a program.

In most cases, the programs are straightforward and easy to follow, although there are a few cases where Goto statements are used to hop out of the mainstream and then to return back.

Each chapter (one chapter per program) includes a short description of the method used, information on program structure, an application example and an analysis of the results. The book also includes complete listings of the programs; this makes the programs easy to implement.

All in all, the book is well worth its $12.95 purchase price if you have a use for the programs.

Neil Omvedt
Roseville, MN

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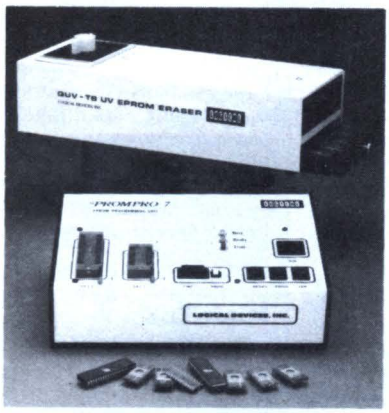

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NEW SOFTWARE

Edited by Dan Muse

Music for the Apple

Electronic Courseware Systems Inc. has announced the release of a series of music activity lessons for the Apple II computer. The programs include Music Note Name Drill, Pitches on the Keyboard, Key Signature Drill and a new ear training game called Ear Challenger.

The programs have been student tested. The software requires an Apple II with 48K and one disk drive; each costs $39.95.

The series is also available for other computer systems.

Electronic Courseware Systems Inc., PO Box 2374, Station A, Champaign,IL 61820. Reader Service number 465.

Mail Track I and Expense Track

Sapana Micro Software has announced two software programs called Mail Track I and Expense Track I.

Mail Track I stores 1100 mailing labels on a single-sided floppy disk and 2200 on a double-sided disk. The list remains in zip-code order as you enter the information and warns of duplicate entries. The program can handle foreign addresses and uses $3\frac{1}{2} \times 1\frac{5}{16}$-inch size labels. Selected entries can be moved to another file and can be edited. The program requires 64K, display, one disk drive, PC DOS and printer. The program sells for $29 with manual.

Expense Track I is a program to keep track of expenses throughout the year and is valuable when it comes time to file a tax return. Seven fields are provided for data entry: date, description, category, method of payment code, method of payment, tax status and amount. It can store 2496 expense entries on a single-sided floppy disk and twice that amount on double-sided disks. Expense Track I costs $29 with manual and requires 64K, 80-column display, one disk drive, PC DOS; a printer is optional.

Sapana Micro Software, 1305 South Rouse, Pittsburg, KS 66762. Reader Service number 464.

Patient Recall System

Customware Computer Consultants Inc. has announced the release of the Patient Recall System. The system, which is designed for the Apple II Plus, allows the user to inquire into individual patient records. It also provides options to print recall address labels or customized recall cards.

The Patient Recall System also has a feature which will let the user print address labels for patients belonging to a specific category of service. A patient master list may be printed upon request. This list contains important information sorted by the patient's last name.

The system, which includes complete documentation, costs $395. The user's manual may also be purchased separately for $25. Customware Computer Consultants Inc., PO Box 998, Lombard, IL 60148. Reader Service number 460.

QUNIX Operating System

PC/Software is introducing the QUNIX Operating System, a new software product for the IBM PC that will allow up to eight persons to simultaneously use one computer while engaged in up to 250 simultaneous functions.

Features of the new operating system include a hierarchical file structure that allows the user to file programmed material by topic; a 16-character capability for file and directory names; built-in security that protects information that is contained on program disks; the ability to communicate with any other personal or mainframe computer by telephone or cable; and powerful, easy-to-use commands for printing, sorting, comparing and backing up files.

The QUNIX operating system is compatible with a variety of disk drives, modems and printers. It also has the ability to read disks written under the PC-DOS operating system.

There are five QUNIX systems available to meet the precise needs of the user. Two of the systems are designed for general use and include program development tools together with the text formatter system. The other three are designed for business use in which application software will be purchased separately.

The QUNIX system ranges in price from $350 to $950. PC/Software, 926 Natoma St., San Francisco, CA 94103. Reader Service number 463.

Stock Momentum Studies

Stock Momentum Studies is a graphic analytical program for the Apple II computer. Based on price movements, Stock Momentum Studies lets you chart any stock, commodity or market index in a variety of modes.

The program has the ability to display two differentials, exponential averages or moving averages overlaid on one screen. Also, the timeframe being analyzed can be compressed or expanded from a few weeks to a full year.

Stock Momentum Studies has a sort program that will put data for up to 350 entries into chronological order in less than 45 seconds. Hard copy can be printed in alphanumeric or graphic form.

The package includes a loose-leaf-binder manual, four master disks and 2K EPROM board. The Stock Momentum Studies sells for $525. Troy/Folan Production Inc., 29 Miller Road, Wayne, NJ 07470. Reader Service number 461.

MicroTLX

MicroTLX is a CP/M software package that lets you turn any CP/M computer system into a full-featured Telex machine.

With MicroTLX you can:

- Directly send and receive Telex and TWX messages
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- Have immediate access to commodities prices (updated twice daily)

MicroTLX comes with comprehensive documentation. The package costs $150. Advanced Micro Techniques, 1291 E. Hillsdale Blvd., Suite 209, Foster City, CA 94404. Reader Service number 462.

Computer SAT

Computer SAT is the first software-textbook package for personal computers. The program leads the student through a step-by-step test preparation process. The package diagnoses the student's strengths and weaknesses and prepares study exercises.

The Computer SAT package consists of the 470-page textbook *How to Prepare for the SAT*, two floppy diskettes containing programs on both sides and a User's Manual that guides the student through the system.

The textbook contains four complete SAT practice exam-

inations. The program scores the tests, analyzes the student's performance and creates a personalized, prioritized study program.

The package is designed for the Apple II and Apple II Plus and is priced at $69.95. Harcourt Brace Jovanovich, Inc., 1250 Sixth Avenue, San Diego, CA 92101. Reader Service number 466.

PathFinder II

PathFinder II is a multioption satellite tracking package which can track any circular orbit satellite from anywhere in the world on either a world or U.S. map in hi-res graphics.

The program can also track in real time without a real-time clock; obtain all data in tabular format for analysis; print all maps and tables on your Epson MX printer, and predict future orbits, including reference orbits.

PathFinder II supports a disk-resident database of satellite tracking data. It can compute and present a summary of orbital characteristics using an exclusive high speed, accurate prediction algorithm.

PathFinder II is currently available for the Apple II Plus with ROM Applesoft, 48K RAM and one disk drive with DOS 3.3. An Epson MX series printer with Graftrax or Graftrax Plus will allow the program's capabilities to be more fully realized.

PathFinder II comes complete on a DOS 3.3 disk with a user's manual and is available at an introductory price of $34.95. Computer Applications, 3628 A Court, Oxnard, CA 93033. Reader Service number 475.

Window

Window is a full-screen text editor for the IBM Personal Computer. All the inscribed keys of the IBM keyboard such as Scroll Lock, INS, DEL, PgUp and PgDn are fully compatible with the Window.

The Window can be used to create or edit textual documents, correspondence or programs in any of the popular PC languages.

Some of the features of Window are all cursor movements, four-directional scrolling, search and replace, insert and delete, move and copy text, split and join lines, text files larger than available memory and fully descriptive messages; most of these functions require only a single keystroke.

Requirements for Window are an IBM PC with at least 64K of memory, at least one disk drive, and a Monochrome display and adapter running a required IBMDOS.

Window comes on 5¼-inch disks and is priced at $150. Intellect Associates Incorporated, PO Box 365, Holbrook, NY 11741. Reader Service number 474.

COMPU-STAT

COMPU-STAT is a general statistics program for the Sinclair ZX-81 (TS 1000) with 16K RAM or more. The program quickly calculates most descriptive statistics, graphs frequency distributions and generates three tests of statistical inference. The statistics include mean, median, 95 percent confidence limits, standard deviation, variance, range, high and low values and standard error of mean.

All graphs, data lists and statistical values can be output on the ZX printer. COMPU-STAT is menu-driven for easy access to functions like data editing, listing or data storage on tape. Five hundred scores can be entered on machines with 16K RAM and 200 more scores may be entered for each additional 1K RAM.

COMPU-STAT, including cassette program tape and user's manual, is available for $9.95 from Computercraft, 156 Drakes Lane, Summertown, TN 38483. Reader Service number 473.

Text Editor for IBM

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tion and editing keys on the IBM keyboard.

Features of PCEdit include: on-line helps and prompts, global search and replace, large file editing, block move and a limited undo capability.

To run PCEdit, IBM users must have a Personal Computer configured with DOS, at least one disk drive and at least 96K bytes of RAM memory.

For a limited time, PCEdit is priced at $98. Personal Systems Technology, Inc., 22957 La Cadena, Laguna Hills, CA 92653. Reader Service number 472.

Metatype

Metatype is a new word processor for CP/M. Metatype offers true proportional spacing, character widths, margin justification either by adding extra space between words only, uniformly throughout the line or uniformly whenever space between words exceeds a programmed maximum size; programmable boldface by number of overstrikes and carriage offset is also offered.

Deletion recovery is provided by a series of safeguards making Metatype very easy to use. The last deletion is easily reinserted in case the user changes his mind. Other safeguards are the "freeze" and "thaw" operations which isolate on only the text being heavily edited.

Metatype supports standard typing habits by allowing carriage returns in the middle of paragraphs when documents are being typed. You do not have to relearn to type because Metatype does not use the carriage return as an automatic paragraph separator.

Metatype costs $360 and is available from Westico, Inc., 25 Van Zant St., Norwalk, CT 06855. Reader Service number 471.

SAVVY Personal Language

SAVVY Marketing International has released the SAVVY PERSONAL LANGUAGE. The language is compatible with the Apple II computer and allows personal language interaction with the user. SAVVY comes with the following applications: General Ledger, Accounts Receivable, Accounts Payable, Payroll, Mailing List, Document Writer, Inventory Control and others which will follow.

With SAVVY, a user is able to utilize his own language style to develop all system commands, utilities and programs. All programs are self-loading, self-relocatable and serially reusable.

SAVVY provides for redefinition of system commands on an on-going basis, so all programs can be modified at any time. The key to this is SAVVY's Adaptive Recognition Processing which "trains" an internal Robot Programmer to actually write the program in machine language.

The SAVVY PERSONAL LANGUAGE System costs $995. SAVVY Marketing International, 100 South Ellsworth St., 9th Floor, San Mateo, CA 94401. Reader Service number 470.

The Letter Carrier

The Letter Carrier is a powerful word processor mail-merge system which allows you to create a mailing list in upper and lowercase and then merge the list with the letter.

The Letter Carrier has a text editor called The Letter Maker. The editor scrolls so you will print exactly what you see. Data entry is screen formatted, fast, accurate and in upper and lowercase. With the Super Sort you can sort a mailing list of 725 records in less than four minutes.

The Merge allows you to merge a letter with a mailing list with the insertion of fields even within the body of the document. The Merge includes a dictionary to convert state abbreviations to the full state name. Defaults can be set to automatically insert information where fields in your mailing list are blank.

The Letter Carrier lets you target your mailings to a specific group. For example, you could print letters to those companies located in Chicago that did $10 million in sales.

The Letter Carrier word

processor costs $150 and is designed for the Apple II or Apple II Plus with Applesoft ROM (a minimum of 48K), one disk drive, DOS 3.3, a monitor and printer. Target Enterprises, 50 Arvesta Street, Springfield, MA 01118. Reader Service number 469.

Christmas for Your Apple

The Apple Family Sing-Along Christmas Disk is an inexpensive disk full of your favorite Christmas songs. The music will play on the Apple II, or Apple II Plus, with 48K, a disk drive and the Applesoft language. It will also run on the Apple III in emulation mode.

The carols are multivoice, in full four-part harmony. The Apple presents the words of each carol on screen and the music is pitched so audience members can sing along. The only thing missing is the bouncing ball.

The Apple Family Sing-Along Christmas Disk is available from dealers or directly from Solutions Softworks for $24.50. Box 72280, Roselle, IL 60172. Reader Service number 468.

TE100

TE100 is a software package which allows an IBM Personal Computer to function as a Digital Equipment Corporation VT100, VT101 or VT52 terminal. TE100 implements virtually all features of these terminals, including setup mode, character attributes, line and character insert, and delete and modification of terminal characteristics from the host computer system.

TE100 requires an IBM Personal Computer with one disk drive, monochrome or color display and 64K. It also requires an asynchronous I/O board with appropriate cabling and MS DOS operating system. The software package costs $125. Persoft, Inc., 2186 U.S. Highway 51, Stoughton, WI 53589. Reader Service number 467.

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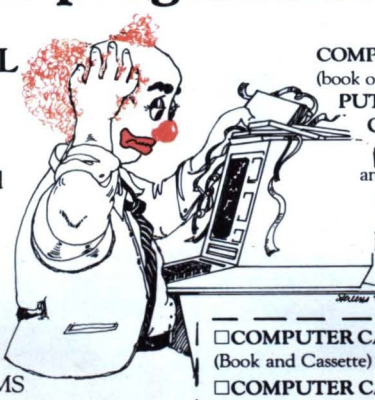

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Atari Bank Select Memory

Mosaic Electronics has introduced its next generation of memory boards with the Mosaic 64K RAM Select for the Atari 400.

The board, which offers several advantages over currently available select boards, consists of 48K RAM with four banks of 4K RAM addressed above the 48K limit. This ensures that the 48K recognized by the OS is continuous and 52K is always available. It also means a ROM cartridge will not affect the availability of bank select memory. The 4K RAM banks allow for a larger hard-wired RAM size; all Atari software and peripherals are compatible.

The board is available from Mosaic Electronics, PO Box 708, Oregon City, OR 97045 for $249.95. Reader Service number 495.

H-1000

The H-1000 gives you all the benefits of a 16-bit CPU in your Heath/Zenith H89 while maintaining full compatibility with your present system.

The H-1000 is a drop-in replacement CPU board that doubles the speed, memory and I/O capacity of your H89. The 8086, a 16-bit processor, has also been added.

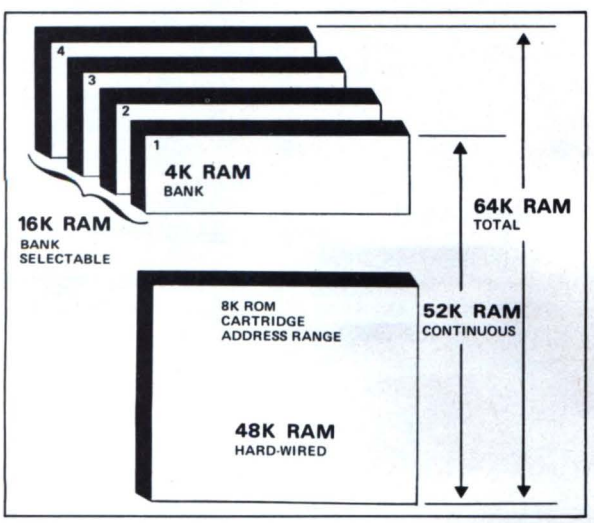
The H-1000 comes standard with 128K of memory, but can be expanded to ¼ megabyte on-board or to a full megabyte with accessory memory cards. Two additional I/O card slots—for a total of five—are also provided. This gives you three available I/O slots for expansion compared to the one normally provided.

The H-1000's 8 MHz 8086 is totally compatible with the 8088 used in the Zenith Z100 and IBM Personal Computers, yet it offers twice the speed.

The H-1000 leaves your Z 80 operating system (HDOS, CP/M or Pascal) intact, so all your existing software runs without modification.

Fully assembled and tested, the H-1000 requires no soldering or special tools for installation.

The H-1000 sells for under $1500 and is manufactured by TMSI (Technical Micro Systems Inc.), PO Box 7227, Dept. H, 366 Cloverdale, Ann Arbor, MI 48107. Reader Service number 493.



The 64K Mosaic RAM Board offers four banks of 4K RAM.

A high-resolution digital Mouse input device can now be used with Apple, IBM and S-100 microcomputers. A new decoder/interface by Random Access allows the Mouse to transfer drawings to any point on the display screen.

Mouse Decoder/Interface

Random Access, Inc., has introduced a decoder/interface system which allows a Mouse pointing device to be used with Apple, IBM and S-100 computers.

The Hawley Mouse is a high-resolution digital input device that has not previously been available for microcomputer use.

The Mouse, when joined to a microcomputer with the Random Access Decoder/Interface, moves the cursor on a computer display screen in direct proportion to its own movements. Capable of precise relative or absolute positioning of the display cursor, the Mouse is not restricted to a fixed tablet area or the limits of a single-screen display.

The Mouse can be used for transferring drawings to the computer or will move the cursor directly to any point on the display screen. The Mouse eliminates many keystrokes and functions. It also allows direct, instant selection and activation of symbols in menu-driven software.

The unit is composed of a decoder and host interface card. The Mouse plugs into the decoder logic housed in a small cabinet located external to the host system.

The Hawley Mouse and Random Access Decoder/Interface are available for $650. Separately they cost $415 and $295, respectively. Random Access, Inc., 246 Highland Road, Pittsburgh, PA 15235. Reader Service number 491.

JS-89 Joystick

The JS-89 Joystick Interface is designed to interface the famous Atari Joystick to the H89 computer. To install this interface remove an IC from the computer's serial in-

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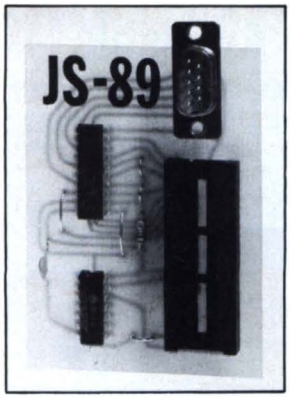


The JS-89 Joystick Interface allows you to use your Atari Joystick with the H89 computer.

terface board and plug the JS-89 into its place. An Atari joystick plugs into the JS-89.

To program the joystick input simply read the stick with Basic's INP() or Pin() statement.

The JS-89 costs $19.95. A free copy of documentation may be obtained by sending a self-addressed, stamped envelope to Gregory A. Saville, PO Box 5190, San Diego, CA 92105. Reader Service number 484.

2S + 2P + RTC

The 2S + 2P + RTC is a board that replaces the serial board in the Heath/Zenith H88/H89 computers. The board provides two serial input/output ports that are software and cable equivalent to the H88-2 and two parallel input/output ports (16 bits output and 16 bits input plus handshaking line. Four of the input bits may be used as status signals). The 2S + 2P + RTC also provides a real-time clock (RTC).

The RTC may be programmed to interrupt with alarm on every 1/10 of a second, second, minute, hour, day, month, etc.

The 2S + 2P + RTC costs $110 without serial option; with serial options the board costs $155. W.I.S.E., Box 344, 422 Third Street, Baraboo, WI 53913. Reader Service number 487.

SBE-80 and 85

The SBE-80 and SBE-85 are in-circuit emulators for use in testing and debugging hardware and software of Z80 and 8085-based systems. Each unit provides real-time emulation up to 6MHz with a hardware breakpoint, 16K bytes of static RAM that is mappable into the target system in 2K blocks and an RS-232 interface for operation with a terminal or host computer.

The command set gives you control over single-stepping, examining and modifying registers or memory, an in-line assembler, disassembler and up and down loading hex files in Intel format. Some of the other commands include fill-memory block, move block, compare blocks and text block.

Each in-circuit emulator is built on one board and packaged in a 9¼ × 8¾ × 1½-inch case. The memory is implemented using 2K × 8 static RAMs that are compatible with industry standard 2716 EPROMs. This allows commonly used routines or diagnostic packages to be permanently placed in the emulator and then run on the system under test.

The SBE-85 costs $1695 and SBE-80 costs $1895. Huntsville Microsystems, P.O. Box 12415, Huntsville, AL 35802. Reader Service number 489.

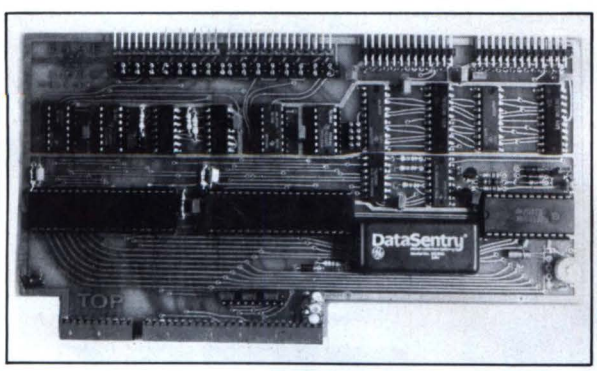
The new Video-310A monitor from Amdek has comfort view amber phosphor CRT and TTL video compatibility.

Video-310A Monitor

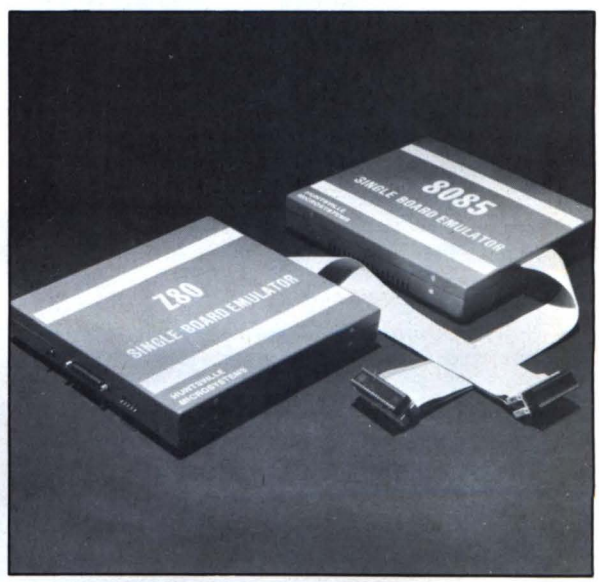
The Video-310A monitor from Amdek Corp. has TTL input which makes it compatible with the IBM Personal Computer. The monitor features a comfort-view, nonglare amber phosphor screen.

The Video-310A has an 18MHz bandwidth and 900 lines resolution to produce sharp, clear displays.

The Video-310A monitor sells for $230 from Amdek Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007. Reader Service number 492.



The 2S + 2P + RTC provides two serial input/output ports, two parallel input/output ports and a real-time clock. It replaces the serial board in the Heath/Zenith H88/H89 computers.



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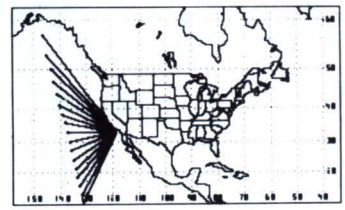

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The FingerTip Controller from KY Enterprises.

The FingerTip Controller

The FingerTip Controller is a versatile directional-style button configuration which has five arcade-quality soft-touch buttons. The controller allows rapid firing and fast directional changes.

The FingerTip Controller works with the Atari 400/800 and Commodore VIC 20 computers.

The unit is made of unbreakable plastic and has a six-foot cable. It is designed to be hand-held or placed on a table. Models for left-handed people are available.

The FingerTip Controller is available for $19.95. KY Enterprises, 195 Claremont, Suite 288, Long Beach, CA 90803. Reader Service number 486.

PR2020 Speech Peripheral

PR2020 Speech Peripheral features an unlimited English vocabulary and converts ASCII coded text input into immediately intelligible, clear, enunciated speech output.

The system interfaces to most microcomputers via an RS232C serial port.

The PR2020 speech peripheral is packaged for rack mounting or table-top usage. It contains Telesensory's PROSE 2000 text-to-speech converter board, two-watt audio amplifier, power supply, serial interface electronics and front-panel controls.

Because the PR2020 does not use prestored speech to create voice output, the vocabulary capability of the speech peripheral is essentially unlimited. The creation, updating and expansion of the vocabulary require only simple text editing.

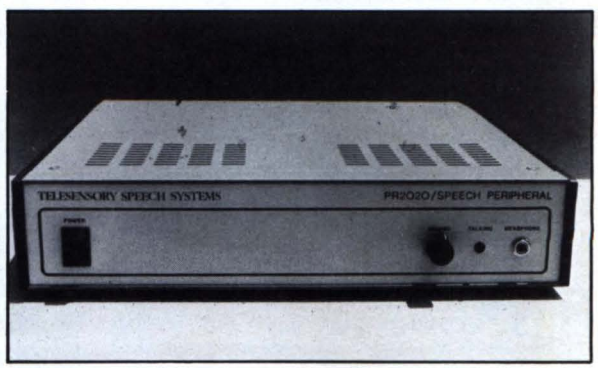
The price of the PR2020 speech peripheral is $4800. If a board-level voice response unit is more desirable than the complete unit, the PROSE 2000 text-to-speech converter used in the peripheral is available for $3500. Telesensory Speech Systems, 3408 Hillview Ave., Palo Alto, CA 94304. Reader Service number 490.

Peripherals for VIC-20

DATA 20 Corporation has introduced four peripherals for the Commodore VIC-20. The products are Video Pak, Printer Interface, Expansion Chassis and Memory Cartridge.

The Video Pak plugs directly into the VIC-20 expansion port and gives you a standard 24-line display with a choice of 40 or 80 upper and lowercase characters. It also increases memory from 5K to 20K or even 70K. The increased memory allows the VIC-20 to run Commodore business software.

The Printer Interface matches the VIC-20 to most popular printers and gives a



Telesensory's PR2020 Speech Peripheral.

The Video Pak cartridge, one of four new peripherals for the VIC-20, gives you the choice of 40 or 80 characters. Video Pak, Printer Interface, Expansion Chassis and Memory Cartridge are manufactured by DATA 20 Corporation.

continuous visual monitoring of the data transfer functions.

The Expansion Chassis lets the *VIC-20* run a series of four compatible memory, software or game cartridges with the standard 22-pin edge connector.

The Memory Cartridge boosts the brainpower of the VIC-20 to 20K. It is housed in a rugged plastic case and is an ideal first add-on to any VIC-20.

Video Pak costs $299.95; Memory Cartridge is priced at $99.95; the Printer Interface costs $69.95 and the Expansion Chassis sells for $64.95. DATA 20 Corporation, 23011 Moulton Parkway, Suite B10, Laguna Hills, CA 92653. Reader Service number 488.

COLORPLUS

COLORPLUS is a color graphics adapter that can produce attention-commanding high-resolution graphics. Its biplanar technology enables high-resolution (640 × 200 pixels) four color, 80 character graphics or medium-resolution (320 × 200 pixels) full 16-color, 40-character graphics.

COLORPLUS requires only one expansion slot and is not slot sensitive. COLORPLUS is fully compatible with all existing IBM software and only minor changes are needed to take advantage of the extended features.

COLORPLUS is priced at $995 and includes full documentation and start-up software. Frederick Electronics Corp., PC+ Products, 7630 Hayward Road, PO Box 502, Frederick, MD 21701. Reader Service number 482.

New Publications

Three new microcomputing periodicals have recently been introduced:

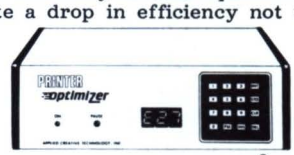
Microcomputing Periodicals—An Annotated Bibliography notes and gives short descriptions of 298 publications related to the microcomputing industry. It costs $15 and can be obtained from George Shirinian, 53 Fraserwood Ave. #2, Toronto, Canada M6B 2N6. Reader Service number 478.

Personal Computer Products Buyer's Guide is, appropriately enough, a buyer's guide for IBM Personal Computer owners. It contains 28 pages and covers hundreds of products. A new edition of the guide is mailed every six weeks. Single copies are available for $1.00; a one-year subscription is available for $8.00. Star Ware, 1701 K Street NW, Suite 801, Washington, DC 20006. Reader Service number 479.

The Classroom Computer News Directory of Educational Computing Resources is prepared by educators for educators. It contains descriptions of periodicals, professional associations, on-going

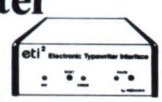
Do You Use a Printer or Modem?

The average microcomputer "moves" data at 120,000 characters a second. A typical disk drive transfers it at 27,000 CPS. Most printers however plod along at 100 CPS and many modems squeak out 30 CPS. That's quite a drop in efficiency not to mention a waste of computing power!



We've broken this bottleneck with a smart little "white" box called the PRINTER OPTIMIZER® that features a 64,000 to 256,000 character memory buffer. Now you can "print" your inventory in 2 seconds instead of 10 minutes, and no longer will your computer be tied up transmitting or receiving modem transmissions. The OPTIMIZER is smart too. You'll notice a keypad and display in our picture. You can tell the OPTIMIZER to convert data, send control sequences, pause on cue, and more. For example: access all of your printer's capabilities (graphics, font size, forms control, special symbols) with the ease of selecting a station on a pushbutton car radio. Use it to adapt an XYZ printer to your ABC computer running a PDQ word processing program. Run a serial printer or modem from a parallel port. If you can afford and justify a disk drive, then you certainly need our OPTIMIZER to bring your printer, plotter or modem "up to speed" with the rest of your system.

If You Need A Letter Quality Printer



...then consider our affordable yet high quality alternative. Our MEDIAMIX ETI²® converts an IBM Electronic Typewriter (and some other brands) into a computer printer. Every office needs a typewriter. So for example, you can buy an IBM Model 50 ET that costs about $1200 and have a superior typewriter, and then with our ETI² have a printer that produces probably the highest quality printed image available. You can even do typesetting like this ad! And for financial printing you can't beat a wide carriage IBM ET. It's a truly cost effective investment. There are a number of arguments in favor of choosing this route over a single use computer printer, and we have an article on this subject you should read.

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projects, funding and many sources of ideas, information and materials. The Directory is available now in bookstores and computer stores for $14.95 (paperback) and $29.95 (hardcover).

Classroom Computer News, 341 Mt. Auburn St., Watertown, MA 02172. Reader Service number 480.

Numonics Plotter

A new plotter has been introduced by Numonics Corporation. The low-inertia gritroller paper transport produces a superior line quality. The use of nonsprocketed paper eliminates slip and provides excellent repeatability. Because only the paper moves for the X axis, the Numonics plotter overcomes problems caused by inertia in earlier plotter designs.

A unique feature of the Numonics plotter is the resident program for plotting smooth nonpolygonal arcs.

The Numonics plotter can store up to 3800 ASCII command characters or this same capacity can be used to store special down-loaded customer defined fonts.

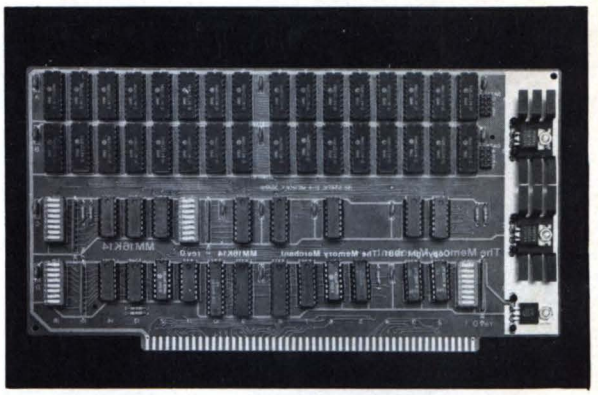
The plotter sells for $1295. Numonics Corp., 418 Pierce St., Lansdale, PA 19446. Reader Service number 481.

MH89 plus 3

The MH89 plus 3 is an accessory for Heath/Zenith H89 and Z90 computers which doubles the I/O expansion capabilities. It replaces the right-hand accessory board area with a six-slot motherboard.

The three added slots have four device-select lines each. They are separately port addressed on eight-byte boundaries, allowing boards strapped for the same address to be run without conflict.

The MH89 plus 3 is simple and compact in design. All accessory boards stay on the right side of the machine and, like the original, mount vertically for cooling. The MH89 plus 3 does not interfere with the left-side memory-expansion area.



Memory Merchant's 16K static RAM board.

Installing in minutes using only a screwdriver and flashlight, the MH89 plus 3 requires no soldering, trace cuts or modifications to your machine.

The MH89 plus 3 costs $150 and includes complete documentation and a one-year warranty. Mako Data Products, 1441-#B N. Red Gum, Anaheim, CA 92806. Reader Service number 485.

Correcting RAM board

VR Data Corporation has introduced a 192K/byte-correcting RAM board for the IBM Personal Computer. The error-correction circuitry on the VR Data RAM Board corrects single-bit errors and guarantees detection of 2-bit errors.

Error correction takes place on every read cycle. If a bit error is detected it is corrected and the corrected data is presented to the processor and also rewritten in memory, preventing the accumulation of errors. This is all done without the use of wait states.

The board is available in 0K and 192K configurations. The 0K user is upgradable to 64K increments.

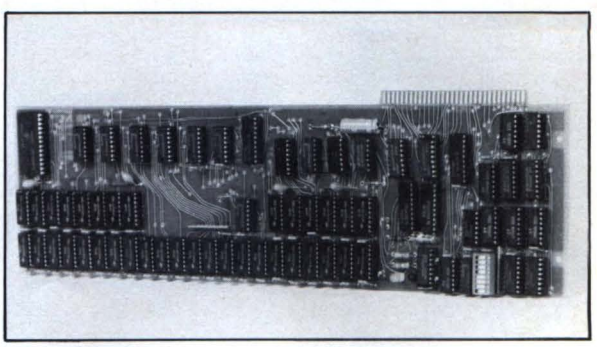
The 0K configuration costs $475; the 192K configuration sells for $785. VR Data Corporation, 777 Henderson Blvd., Folcroft, PA 19032. Reader Service number 496.

Memory Merchant 16K Board

Memory Merchant has introduced a 16K static RAM board that fits virtually every conceivable user application. Some of the features offered are segment disable, bank select, extended addressing and phantom enable.

The 16K board uses the 2114 RAM chip which guarantees 4MHz operation and is compatible with 8080, Z80 and 8085 processors.

The board costs $169 and is available from Memory Merchants, 14666 Doolittle Drive, San Leandro, CA 94577. Reader Service number 494.



VR Corporation's 192K/Byte error-correcting RAM board for the IBM Personal Computer.

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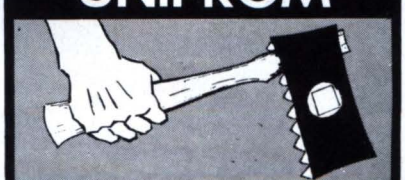

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from page 178

Totals for each account can be obtained for a day, a month or any specified time period within the current year.

Accounts are not necessarily restricted to dollars and cents figures. Any numerical category may be represented, such as mileage or time.

Each account is identified by the account number as well as a special symbol. Whenever a numeric amount is preceded in an entry by one of the account symbols, that amount will be recognized by Time Manager as a transaction for that account. This provides a convenient means of totalling amounts by account. There is also a keyword search and scan feature for finding and totalling by category.

The accounting features of Time Manager are very comprehensive and flexible.

Time Manager has the capacity for 12 screens of information called notepads. These are in addition to the features previously discussed, and are primarily for the entry of miscellaneous information.

As supplied, these 12 screens are filled with quick reference information pertaining to the use of Time Manager. As familiarity with operation of the system grows, this information can be erased and replaced with whatever the user desires.

A notepad may be selected from either the month or day level. As with categories and accounts, notepads have names which will help to keep various kinds of information separated. Again, these may be changed to serve the user's purposes.

Each notepad can contain a maximum of 23 lines with a maximum of 40 characters and/or spaces per line.

Provisions are made for printing data from Time Manager in two ways. A single screen display may be transferred to the printer or, alternatively, a range of days or months may be printed in one operation.

If your Apple is equipped with either of the supported clock cards, Time Manager can be requested to sound a buzzer at a particular time, (e.g., to remind you that it is time to make a phone call).

Time Manager was designed to be compatible with as many Apple configurations as possible. If the disk controller contains 16-sector PROMs (DOS 3.3 or Language System), Time Manager can read and write both 13- and 16-sector data diskettes, selecting the appropriate format automatically.

Users of 13-sector PROMs should only attempt to use 13-sector data diskettes.

The master data diskette provided in the package is in a 13-sector format so both PROM sets will be able to use the program.

Although reading a description such as this may give the impression that Time Manager would be complex and hard to use, such is not the case after hands-on experience.

The documentation is excellent, and one or two readings accompanied by the practice examples in the manual should familiarize anyone sufficiently to start benefiting from the program.

And it is a benefit to anyone who can't trust memory alone when a myriad of details, dates, etc., must be recalled. Come to think of it, that description probably fits most of us.

Run it first thing every morning and never forget an appointment, birthday or anniversary again.

(Image Computer Products Inc., 615 Academy Drive, Northbrook, IL. 60062. $149.95)

Ronald H. Bobo
St. Louis, MO

THE WORD Processor

This package puts the Entire text of the Bible at your fingertips

This package includes the entire text of the King James version of the Bible and programs to manipulate that text. As such, THE WORD Processor might be considered a database management system with the text of the Bible as its fixed database.

The text manipulation features include routines for displaying and printing text, searching for the occurrence of specific words or phrases and the generation of indexes of references.

Scanning the text can procede sequentially through a given book or passage or can be ordered through the use of an indexed list of references. It is this reference indexing capability which will be of most interest to students of the Bible. This feature lets you specify a target set of words, phrases, word suffixes or word prefixes upon which to perform a search. The limits of this search can be specified in terms of the book and chapter to begin and end the search. The reference to each occurrence of the target set can be selectively added to a list of references which can serve as an index to a subsequent scan of the Bible text.

Several separate indexes can be completely merged or only those references which occur in both indexes can be selected and merged into a new index. Thus it is possible to develop indexes of references to very complex topics. The indexes can then be printed, giving a list of the accumulated references, or they can be used to direct the display or printing of the referenced verses.

Documentation for THE WORD Processor consists of a 35-page booklet which I found quite adequate in explaining the use of the package. The booklet includes a tutorial exercise which illustrates many of the features of the text-manipulation routines. In addition, programming information is included in a one-page appendix entitled "Tailoring the Programs." This provides information for experienced programmers on how to modify certain details of the programs. For example, the programs can be modified to handle a special printer interface. Since THE WORD Processor disks are not copy protected it is relatively easy to modify the text-manipulation routines or, with the aid of a utility program supplied with the package, it is even possible to move segments of the Bible text to new disks. The latter feature might be useful for repeated analysis of specific segments of text; the need to swap the text disks will be reduced by combining segments on a single disk.

A major accomplishment of the authors of THE WORD Processor is the degree of text compression that they have achieved. The approximately 4.5 million characters of the original Bible text are reduced to less than half of that amount. This was done in part by coding frequently occurring words and word segments, and performing decompression of the text at the time it is displayed. Even so, 16 text disks (eight double-sided minifloppies) are included in the package.

THE WORD Processor provides a unique application of the Apple II. The programs are well done with good error trapping to prevent mistakes by even a novice computer user; the documentation is adequate. This package will be of major benefit to any serious student of the Bible.

(Bible Research Systems, 8804 Wildridge Drive, Austin, TX 78759. $159.95)

Larry Gonzalez
Chicago, IL

The ARROW

A utility program For Pet/Commodore Computers

The ARROW is a 2K EPROM containing a machine-language utility program that is available for all new ROM PET/CBM machines with 40- or 80-column screens and large keyboards.

The ARROW adds ten features to the Commodore Operating System. With it you have the ability to Save, Load, Verify, or Append a file at High Speed (3600 baud) using the C2N Cassette Deck. I found, however, that after receiving the ARROW I was unable to perform any of the high speed functions associated with the chip. Remembering that another chip with similar cassette features required the newer type cassette deck, I decided to trade my old one. When the new deck arrived I eagerly plugged it in and recorded a program in high speed. Upon playing back the program I found it

didn't work. So I decided to place a call to DataCap to find out once and for all what I was doing wrong. It was suggested that if I was using tape that had a leader, I should run past the leader before recording. To my amazement my program was saved at 3600 baud and I was able to load the same program.

With the ARROW it is possible to write or read blocks of data from within a machine code or Basic program, using JSR $A7EE(SYS42990) to write a block or JSR $A7F4(SYS42996) to read a block.

Another nice feature is tape positioning; you can position one to nine blocks using fast forward. This allows you enough room to save a 32K program in each block.

The program also features a Repeat function. Any key held down for more than half a second will repeat at a rate of 15 times per second; you can turn this feature on/off at will. It must be off to save at regular speed.

The Flip Character Set switches between the two available character sets, from the uppercase/graphics set to the lowercase/uppercase set—or vice versa.

When you enter the hexadecimal mode two counters appear on the bottom line of the screen. You can add or subtract using the +, – and = keys and you can switch from hexadecimal to decimal input or back again by using the * key. The largest decimal value that can be handled is 65,535 with the hexadecimal maximum at $FFFF.

With the handy Quadruple Density Plotting feature you are able to set, reset or test any position in an 80-by-50 (160-by-50 for the 80 column CBM) grid.

This sample program will draw a rectangle on the screen.

```
10 PRINT"CLR":Z = 1: REM SET
20 FOR X = 0 TO 79:Y = 0: G:Y = 49: G:NEXT
30 FOR Y = 0 TO 49:X = 0: G:X = 79: G:NEXT
```

X and Y are the horizontal and vertical coordinates, and Z is set to 0, 1 or 2 to set, reset or test respectively. After the test option is used, the variable Z will contain 0,1 or 2 depending on whether the defined position was off, on or a nonplot character. Graphics points may not be set where there is text on the screen; you must blank any areas to be used for graphics.

When I purchased my ARROW the documentation was lacking in some areas, but that has been taken care of in the new instruction sheet.

I would recommend the ARROW to anyone who cannot afford a disk drive. *(DataCap, 73 Rue du Village, 4545 Feneur, Belgium, $60)*

Pete Vandrew
Manhattan, IL

Super-Text 40/80

If you write a Great deal, Super-Text 40/80 Is an excellent tool

The world of Apple word processing has been bright for a couple of years now, and with the release of Muse Software's Super-Text 40/80, it has become brighter. The ability to use an 80-column board is one of several new features in the program—but this is not necessarily the most important one.

A list of what I think are important Super-Text 40/80 features follows. Many of these are present in Super-Text II; those which are new or improved are identified in their descriptions.

80-Column Video. What a difference! Being able to see the whole line at once, 24 lines deep, makes editing text so much easier. There are other improvements to Super-Text which I think are more important, but this is certainly the most dramatic.

Headers and Footers. Finally! Super-Text 40/80 allows you to define a message to be placed at the top or bottom of each page in the document. This text, for example, in the manuscript form sent to *Microcomputing*, will have a block at the top of each page giving the article name, my name and page number—but I only

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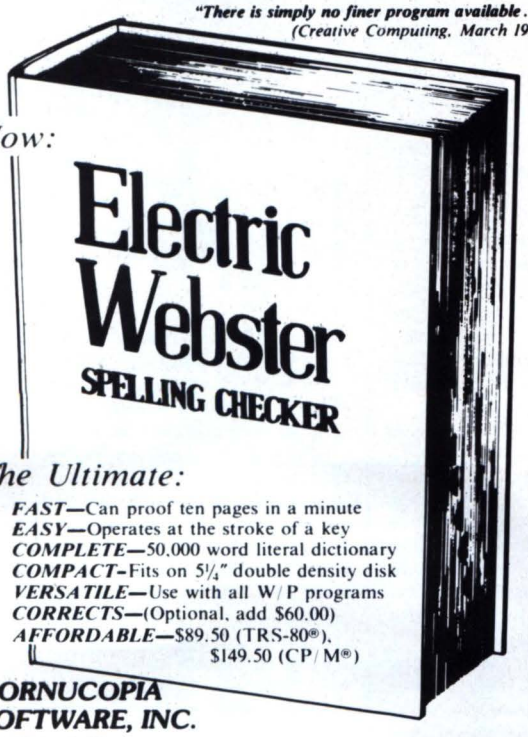

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have to type it once. It could have both a header and a footer; this is useful for books that are prepared directly from the word processor. The header could have the chapter name; the footer could have the page number and/or the revision date.

Invisible markers (new feature). I write equipment manuals. Often in writing a paragraph I want to refer to a paragraph that doesn't yet exist. Instead of referencing a paragraph number which may not be right, I place an invisible marker in its place. Then when I write the paragraph to be referenced, I can return the cursor to the marker and insert the reference.

Autolink. This feature is unchanged, as far as I can see. It lets you chain a number of files, allowing you to search or print several files in one operation.

Find and Replace. This feature has been improved. The earlier version let you enter a target word or phrase, and would search the document for all occurrences of the target starting from the cursor position and working toward the beginning or end of the document according to your directions. Super-Text 40/80 does the same, with some new twists.

First, it allows you to disregard spaces in the target. A search for "GOOD&FELLOW" will find "Goodfellow" (my name) and "good fellow" (a not necessarily accurate description). The function also has a wild card feature, in which the exclamation mark can be any letter. A search for "u!!er" will find both "under" and "upper."

Earlier versions of the program did not allow you to search for a carriage return, the "↑," the "@" or a space. Special control sequences now allow these to be targets.

The new version allows you to find and replace (or just find) several words or phrases in one pass through the text, with a multiple find function.

After the program has searched your file, it tells you how many occurrences of the target it found. This feature, coupled with the new ability to search for a space, can give you an approximation of the number of words in the document. This is accurate to the extent you used the space bar only to separate words.

The automatic "the" key, which allowed you to type this word with one keystroke, can now be defined to any word or phrase you wish, up to 30 characters long. I find this useful for certain problem words.

Block operations are essentially unchanged. With them you may mark a block of text and then save it, copy it, move it, delete it or unmark it. This is a real time saver for me; I like to compose at the keyboard, and I often find that a particular paragraph will work better elsewhere. Of course, the writer who does it perfectly the first time will find this of little value. But then, he doesn't need a word processor, does he?

The split screen function is unchanged. It allows you to look at one part of a file while working on another. I find it useful for keeping format reminders and other notes on screen. When split screen is first selected, the top and bottom portions are of the same size. This can be adjusted to allow more or less lines in either portion.

The preview feature is essentially unchanged, but is greatly enhanced when using the 80-column board. The feature allows you to look at the text on screen, formatted according to your commands. With the preview feature you can see your formatting errors before you commit them to paper. The most important benefit is that you can see where the end of the page will be, and change that if need be, without a lot of hard copy experimentation. Preview is accessed through the query function. Default mode is "print." Pressing "P" from the query function toggles to "preview."

The temporary left margin feature is unchanged. An example of its use would be a numbered paragraph, where the paragraph number is at the true margin and the text starts indented a few spaces. This function indents subsequent lines of the paragraph as well.

A new feature of Super-Text 40/80 is the type-ahead buffer. Earlier versions of Super-Text would sometimes drop a let-

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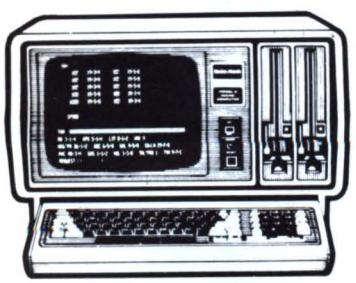

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ter or two if you typed too fast for it to keep up. This problem was most evident when the cursor was near the top of the screen. The solution was to type at moderate speed until the cursor was in the lower half of the screen. Then it was "Nellie, bar the gate!" With the type-ahead buffer, chances are the program will keep up with you no matter what your typing speed or where the cursor is on the screen.

Use of user-definable control characters to access special features of your printer is virtually unchanged, but defining these characters is much easier. Super-Text II was configured to support the Diablo, with instructions on how to change the parameters for use with other printers. Super-Text 40/80 has a number of parameters files supporting Diablo, Epson, Epson G.T., I.D.S., Centronics and NEC printers. You configure the program by selecting one of these files, and configure it again if you change printers. If these existing files do not fit your needs, "rolling your own" is much easier than it was with Super-Text II.

There are some minor changes. For example, earlier versions allowed you to save the text you were working on by merely pressing the return key when in the save mode, providing that text was already on disk under the same name. There was a hazard in this, because you may have wanted to change the name first so you wouldn't wipe out an earlier version. Now you must press the period before pressing return. This step makes saving the edited file under the same name a deliberate action, giving you time to think about it before wiping out the earlier version of your text.

One of the most common typos is incorrect capitalization. It used to be that all changes had to be made from the change mode. Now capitalization changes can be made from the cursor mode by pressing the "1" or "2" key. This is a time saver.

Nit Pickers' Corner

There is no doubt that Super-Text 40/80 is an improvement over the already excellent Super-Text II. However, there are three areas with which I am underwhelmed.

First, the program supports only one of several 80-column boards now on the market. If you don't have the Videx board, you don't have 80 columns—at least not with this program. Muse Software's director of marketing tells me that most of the popular 80-column boards will be supported soon—probably by the time this article is published. If you have some other board, check on this before you buy.

> While Super-Text II is a fine word processor, Super-Text 40/80 is a better one, . . . a much more versatile program

Second, the new version has a smaller file capacity than did Super-Text II—about 5000 characters smaller. The new 14,904-character capacity is still sufficient, but it gives owners of Super-Text II a problem in loading packed-to-capacity files generated on the earlier version. Such a file must be divided and saved as at least two files with the old version before it can be loaded into Super-Text 40/80. Muse's civilized approach to upgrading allows you to keep your old disks, however, so the problem is a minor one.

Finally, Super-Text starts printing on whatever page the cursor is. This is fine if you want to print a file from start to finish, but if you want to print, for example, page 5 only, you must either embed a no-print command at the beginning and a print command where you want the printer to start, or move the cursor down to the desired page. Also, you must embed a CTRL-N 5 (for page 5) in text so the program won't think it's printing page 1. I would like to see a feature that allows you to start printing at a designated page, with no involved procedures to avoid compromising pagination.

Conclusion

Super-Text II is a fine word processor. Super-Text 40/80 is a better one, and worth having even if you do not have a Videx 80-column board. The other improvements, especially the header and footer capability, make it a much more versatile program.

Muse's policy for upgrading to Super-Text 40/80 is more than fair. They will supply Super-Text 40/80 for $50 and the first page of the Super-Text II manual. Since Super-Text 40/80 sells for $175, this is not much to pay for those improvements. Apple owners shopping for their first (or a new) word processor should know there are many others on the market which are easier to learn how to use, but few that can do so much. If your word processing needs are casual, a less powerful (and less expensive) program may be a better choice. But if you write a great deal, Super-Text 40/80 is an excellent tool.

(Muse Software, 347 North Charles St., Baltimore, MD 21202. $175.)

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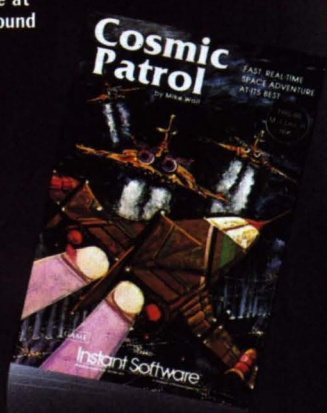

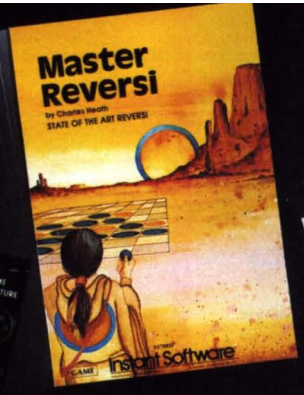

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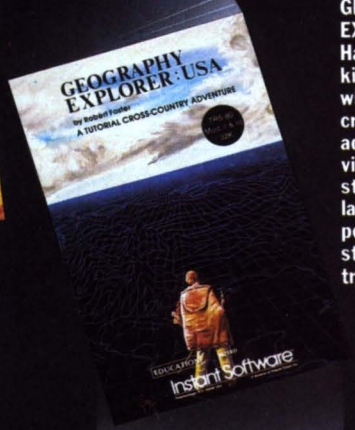

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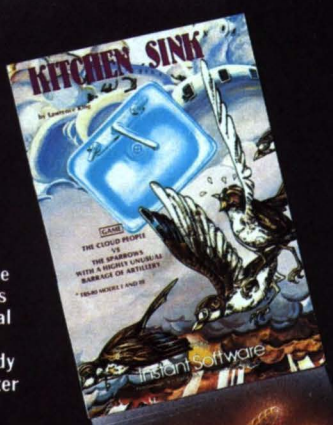

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- Mountain Computer Clock or California Computer Systems 7424 Clock/Calendar module for automatic data setting and time display
- Hardware lowercase generator
- A second disk drive

Time Manager does not support printers requiring special driver programs, clock cards, other than the two above, or high-resolution character generators such as ROMPlus.

Documentation for Time Manager is excellent, consisting of an attractive 98-page manual packaged in a loose-leaf binder containing two disks and a quick reference card containing all the Time Manager key commands.

The data diskette may be backed up—the program diskette has no provisions for user backup, but a spare is available from the publisher for $10.

The data diskette furnished with Time Manager has reference information and sample entries which may be used while familiarizing yourself with the program.

After the data loads, a sign-on message asks for the date or, if you have a clock card, the date will be read from it and displayed. If not correct, you will be prompted to enter the correct date. Upon pressing the return key, a calendar page for the current month is displayed with markers around today's date. Two flashing arrowheads pointing to today's date are called, appropriately enough, pointers.

Pressing the left and right arrow keys lets you page through the months while the S, E, C and F keys move the pointers from one day to another within the month. Pressing the # key followed by a number from one to 12 will display the month corresponding to the number without having to page. Any number greater than 12 displays the calendar for January of the following year.

Time Manager operates on different levels. Pressing the return key moves you to the day level, and displays the current day. The escape key will return you to the month level.

Movement of the pointers within the day level is very similar to that discussed for the month. When moving out of one month into another, a slight delay is encountered while data for the new month is read from disk.

Pressing return while in the day level moves you to the next, or entry, level. Entries are the basic units of information used by Time Manager. An entry consists of four parts: priority, permanence, category and text.

Five levels of priority are implemented: *, 1, 2, 3 and note. The first column of the entry display contains the entry priority, with note priority being designated by a period.

Entries are always displayed in priority order, with higher priority items at the top of the list. While entries with nonstar priorities remain on the day they were made, star priority items always appear on today's date.

The permanence of an entry is displayed in the second column. Most entries will be nonpermanent, while others (i.e., holidays, anniversaries and birthdays) will repeat from year to year. A diskette may be moved to a new year by deleting all nonpermanent entries.

Holidays such as Thanksgiving and Easter, while not falling on the same date each year, should still be flagged as permanent. They may be moved to the proper dates after all nonpermanent entries have been removed.

An entry's category is listed in the third column, and there are 26 of these, designated A through Z. Entries with the same priority are sorted by category code when displayed. The 26 categories may be defined to suit the user's individual needs.

The text appears in the fourth and final column.

Consisting of up to 30 characters and spaces, an entry can contain anything that can be typed on the Apple keyboard, including inverse and flashing characters.

Time Manager can store 208 entries per month (256 with DOS 3.3) on a 12-month data disk. Starred entries are not considered part of a month's capacity and you may have up to 32 of these. As many as 127 entries may occur on a particular day, but only 16 will appear on the screen at one time.

A built-in line editor greatly simplifies the process of making entries or altering existing data.

Three ways are provided to screen information during a search: These are category selection, keyword selection and priority selection. These may be combined in any manner the user chooses. In addition, a provision is made to scan quickly backward and forward in time to find important entries.

Totalling and accounting features help to make Time Manager more than just a sophisticated memory jogger. As many as nine separate accounts can be maintained for general accounting purposes or to provide totals for categories such as income received, hours worked and expenses.

The account descriptions supplied with Time Manager are easily changed if not exactly suited to the user's needs.

(continued on page 173)

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